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Railway Mechanical Engineer

Vol. 102 JANUARY, 1928 No. 1

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PUBLISHED ON THE FIRST THURSDAY OF EVERY MONTH BY THE SIMMONS-BOARDMAN PUBLISHING COMPANY

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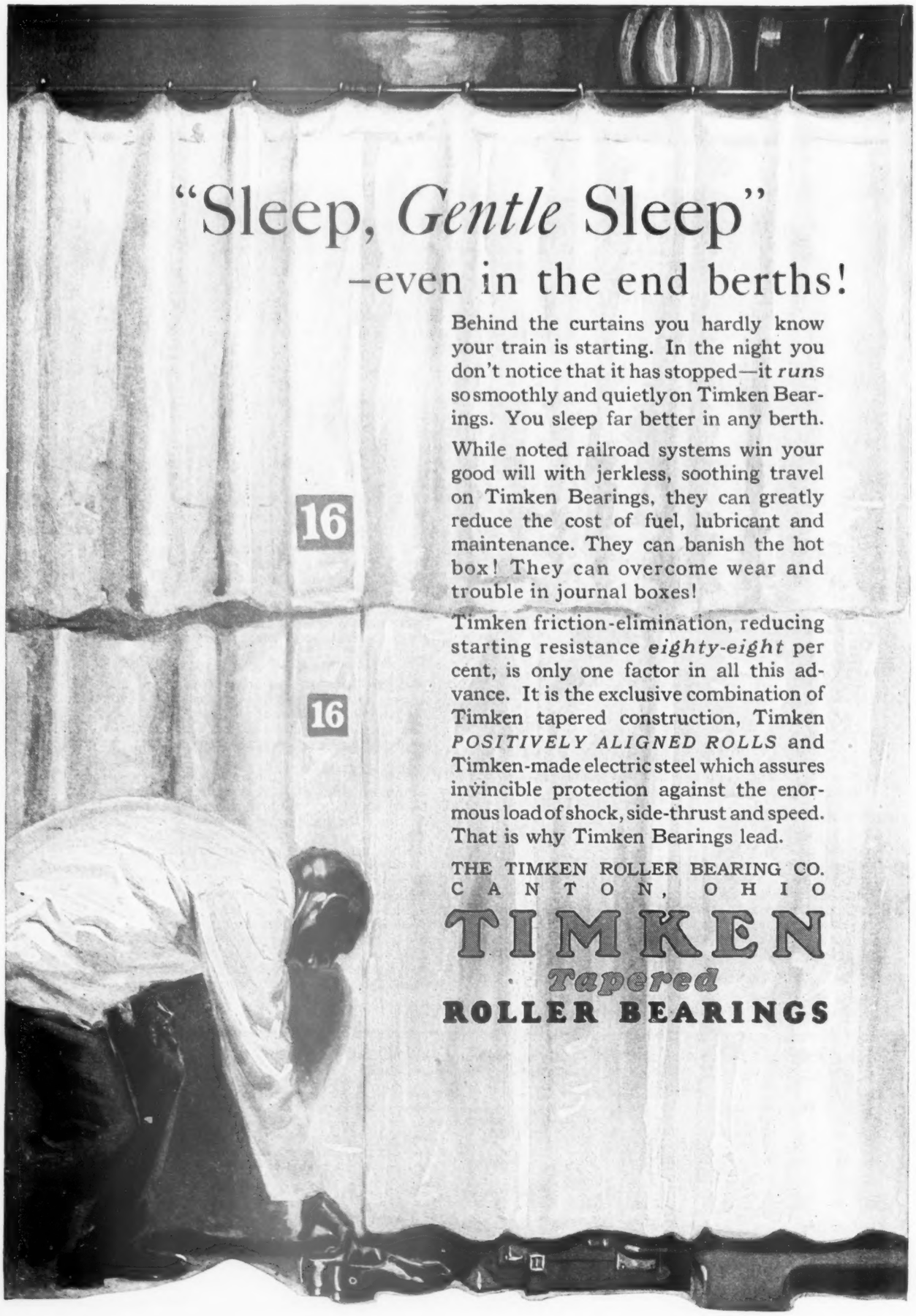
Entered at the Post Office at New York, N. Y., as mail matter of the second class.

Request for change of address should reach the New York office two weeks before the date of the issue with which it is to go into effect. It is difficult and often impossible to supply back numbers to replace those undelivered through failure to send advance notice. In sending us change of address, be sure to send us your old address as well as the new one.

Subscriptions payable in advance and postage free: United States, Canada and Mexico, $3.00 a year; foreign countries, $4.00, or, 17s. sterling.

The *Railway Mechanical Engineer* is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.).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Railway Mechanical Engineer

Vol. 102 January, 1928 No. 1

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It is hardly accurate to say that draft gears are being overlooked, at least not to the extent of being omitted entirely from the car structure. From the point of view of effectiveness as a buffing device, however, many a car now in daily operation on American railroads might just as well have no draft gear at all or else a block of wood or steel between the draft lugs. The importance of properly maintained draft gears with the requisite inherent physical characteristics is unquestionably overlooked to a greater or less extent on almost all roads.

Draft gears overlooked

The reasons for the general apathy toward the condition of draft gears are not hard to find, being due primarly to the fact that the costly effects of deficient gears are cumulative and hidden and do not interfere with the pushing or pulling of trains. Moreover, the difficulty is admittedly hard to remedy.

The evidences of a certain lack of understanding and in some cases actual lack of knowledge regarding the draft gear subject also are not difficult to find. A few cases selected at random may serve for purposes of illustration. For example, a railroad man of long experience, and until recently a close student of car conditions at one of the most important interchange points in the country, recently made the unqualified statement that he didn't think the kind or condition of draft gears used on freight cars made any great difference as long as the cars and their draft connections were strong enough to transmit the drawbar pull from the locomotive. A car department superintendent recently addressed a meeting on freight claim prevention, arguing that in order to minimize this great item of railroad expense, improved car inspection is essential, as well as a higher standard of maintenance of couplers, brake equipment including hand brakes and a better condition of car interiors. In the entire address, no mention was made of draft gears, at least not specifically.

Another illustration occurred slightly over a year ago when the mechanical department head of a small railroad operating about 1,200 freight cars told the newly appointed master car builder that his first job would be to design and employ heavier striking castings to replace those which were broken on nearly 90 per cent of the freight cars owned by this road. After an investigation, the master car builder was able to show that efficient draft gears were needed rather than heavier striking castings and an energetic campaign for the better maintenance of draft gears was instrumental in greatly reducing the casting breakage.

The cost of repairing freight cars, according to the latest figures issued by the Transportation Division of the American Railway Association, exceeds $150 per car per year, of which it has been estimated that 50 per cent, and in some cases even more, is directly chargeable to shocks received by the cars due to defective and deficient draft gears. More attention may well be given and money devoted to the proper maintenance of this highly important part of the modern freight car.

The purchase of a machine tool is frequently based on the claims of the manufacturer that it will produce a given number of pieces of an acceptable quality in a certain period of time. It is not an unusual occurrence that, after a machine has been set up ready for operation, it is found defective in some minor details. A screw may need replacing at one point, a shaft somewhere else requires straightening, or a bearing may not receive proper lubrication for continuous operation. After these defects are corrected, the machine operates perfectly.

Help the machine builder perfect his product

As is the usual practice, a representative of the builder visits the shop and is told that the machine is giving satisfactory results. Not a word is said about the corrections made. The result is that machines of a similar type and design are installed in other shops on which much the same defects have to be remedied. In each of these shops production was delayed while the necessary repairs or corrections were being made. There are cases where similar conditions prevail indefinitely because the purchasers feel that to complain would be considered petty fault finding, especially when the cost of repairs is small.

In cases where the machine builder uses one or more of the machines in his plant, this is not likely to occur, but there are many machine builders who have no use for their product in their own shops. In such cases, the machine is usually given a running test before shipment, but this test may be made with the machine running idle or the test may not be continued long enough to show up the deficiencies.

When a defect or deficiency is found in a machine, though it may be easily corrected, the purchaser should consider it his duty to notify the manufacturer of the deficiency and the manufacturer should consider such action as a distinct favor. The manufacturer cannot see

his product as the purchaser sees it, and, therefore, should consider complaints an aid in the perfection of his product from which in the final analysis the purchaser benefits.

As an engineman sees it

The following are a few points emphasized by an engineman on the Kansas City Southern in a fuel saving paper awarded the first prize in a contest conducted during the early part of 1927: On coal-burning locomotives, the maintenance of light fires enables fire beds to be kept clear of clinkers and ashes with less difficulty than when fires are heavy; this also avoids the necessity of over-drafting locomotives to offset the extra resistance of clogged fuel beds. Good workmanship in locomotive maintenance saves fuel and prevents loss of prestige due to breakdowns. Leaky boiler flues are a serious handicap although they do not always prevent handling tonnage trains to the terminal, particularly if the locomotives are oil burners. Poor steaming locomotives, due to leaky superheater units or other cause, should be repaired in times when business is light and made ready for subsequent heavy duty. In terminal switching there is room for improvement in the operation of terminal crews, many extra moves being preventable by suitable arrangements to provide necessary information in advance. The provision of coupler pin lifters on both sides of cars would save engine and train crew time as well as locomotive fuel. Engine and train delays in regular service have a tendency to spread like epidemics, once started. Water tanks and standpipes should be located so as to save engine moves, where possible, arrangements being made for simultaneous water and switch stops. There is no economy in over-loading locomotives or dispatching one full tonnage train, for example, and another, lightly loaded, immediately after. Extra stops of heavy freight trains cause fuel waste. Slow orders, particularly just before ascending grades, are highly detrimental to fuel economy, and conditions making them necessary should be removed as soon as possible.

A.S.M.E. Railroad Division making progress

Appearing elsewhere in this issue is a report of the annual winter meeting of the American Society of Mechanical Engineers which was held at New York, December 5 to 8, inclusive. This meeting is the biggest event held by the society during the year. The program was unusually well balanced and many of the subjects discussed were of timely importance to the railroad industry. For the first time in several years, the Railroad Division held morning and afternoon sessions during which four papers and a report of progress in railway mechanical engineering were presented. In addition to these papers on strictly railroad subjects, the Oil and Gas Power Division presented a paper on the Diesel locomotive.

For the past six years the winter meeting of the A. S. M. E. has been held in conjunction with the annual exposition of power and mechanical engineering which is held in the Grand Central Palace, New York. Over 500 exhibitors participated in the exposition this year and their exhibits covered a wide range of displays. Heat and power generation occupied a large section with displays of boilers, stokers, furnaces, superheaters, valves and all the other accessory devices that are essential to the economical generation of steam. There were also equally interesting showings of heating and ventilating equipment, power transmission devices, machine tools, woodworking machines and a comprehensive section of instruments for measuring and recording time, pressure, volume, gas and air flow, temperature and the many variables that mechanical engineers in industry must control. Over 100,000 people visited the exposition this year.

During the past year the registration in the Railroad Division has increased from 418 to 1,038. This registration includes mechanical engineers employed by the railroads and railway supply companies, teachers in technical schools and engineers in consulting practice. In many respects it occupies a unique position among the mechanical department associations, in that it provides an opportunity for men representative, of all of these groups, to get together on equal footing at frequent intervals during the year to discuss railway mechanical engineering problems in the solution of which each group has something to contribute. The past few years have seen a marked improvement in the character of the papers presented at its various meetings, regional as well as national.

Railroad shops and machine tools

Production as applied to a locomotive shop is generally thought of in terms of locomotives turned out of shop, yet in its final analysis a broader meaning must be applied which takes into consideration not only the increase in output of units but such an increase at a lower unit cost. Locomotive shops during the last 10 years have been able to increase their output materially as far as the number of locomotives is concerned, in spite of a continual increase in size and complexity of design. Viewed from the cost angle the results in all too many cases have not been so encouraging, for while modern, heavy motive power has made possible many operating improvements that have resulted in increased earnings this has not been accomplished without an increase in maintenance of equipment expenses. Now that the pressure of peak operating conditions has been reduced it should afford an excellent opportunity to review the efforts of the past and decide on a course for the future. What are you going to do to prevent further increases in maintenance of equipment costs?

There may be a lesson in the experience of the automotive industry during the last ten years. In 1916 there were approximately 200 different makes of passenger automobiles on the market, the total production of which in that year amounted to 1,740,000. Ten years later in 1926, the number of different makes on the market had decreased to only about 50, while production had increased, in that year, to almost four million cars. Add to that the fact that the automotive industry today is able to produce a greater number of better cars at a considerable reduction in cost as compared with ten years ago. The industry has passed through a period of consolidation and intensive development which has resulted in today's productive accomplishments. One of the most important single factors in the reduction of automotive production costs has been the gradual transfer of the burden of production from men to machines through the process of installing more productive machine tools, careful planning of plant facilities and the intelligent co-ordination of manual and mechanical operations.

Right at this point it is pertinent to recall some remarks made by a railroad mechanical officer before a 1926 convention: "Careful selection of machines is necessary for economical shop operation and thorough analyses of shop conditions will prevent the often witnessed misfit

machine. * * * Perhaps the great handicap in getting machines which will fit into the shop is the tendency to get a machine for the present only, with little thought given the future and even less thought given as to how the new machine will fit into the industrial scheme of increasing the shop output. In other words there's hardly a railroad shop in the country which bears the stamp of progress made by the industrial or planning engineer, * * * and all of you who help guide the destinies of our railroads can materially assist matters in lowering maintenance costs by getting at the very root of the question, that of modernizing repair facilities. And then with repair facilities and shop equipment as modern as cars and locomotives, we will be able to make shops more productive with a resulting lowering of unit costs."

The tendency today in the railroad industry, as in other industries, is toward consolidation—if not of properties, at least of facilities. Longer locomotive runs have made possible the elmination of many intermediate terminals and repair points and the higher standard of maintenance required has made it necessary to concentrate repair work at the larger shops because of the inability of many smaller shops to handle the heavy work on modern power. What is the general condition of the equipment at main shops and important repair points on your road? Can it turn out locomotives to meet such demands as you have experienced during the past two years at the lower unit costs that are continually being demanded. Or, are you going to try to justify the increased repair costs of the future as an attendant evil to increased traffic? The traffic demands of the future, together with the heavy power on most roads today is certain to impose a burden on the shops that will result in increased maintenance costs unless you get at the very root of the question—that of modernizing facilities. What problem of greater importance could the mechanical department put on its calendar for 1928?

Another year of achievement

Although the business handled by the railroads during 1927 declined as compared with the preceding year by about 224 million dollars while increases in wages are estimated to have added approximately 60 millions to operating expenses, the railroads were able to effect a net reduction of 105 million dollars in operating expenses as compared with the preceding year. Such a decrease, however, was inadequate to prevent an increase in the railroads' operating ratio which rose from 71.3 per cent in 1926 to 74.1 per cent for the year just closed.

While the financial results were thus less satisfactory than for the preceding year, the efficiency with which the properties were actually operated is such that railroad men need not feel ashamed of their accomplishments. In this the mechanical department is no exception. Equipment conditions were good throughout the year. The proportion of locomotives in serviceable condition was higher than during 1926, with the exception of the months of October and November when the proportions for the two years were almost the same. Starting the year with slightly more than 87 per cent in January, the serviceable locomotives dropped slightly below 84 per cent in March, and for most of the remainder of the year varied between 85 and 86 per cent. Freight car conditions also showed a similar improvement over 1926, the percentage of cars in serviceable condition throughout the year varying only fractions of a per cent either way from 94. Only during the last two months of 1926 did the conditions in that year equal those of 1927.

The year also shows improvement in the utilization of motive power. While the miles per freight locomotive day, including all locomotives, has declined slightly as compared with 1926, this is merely the result of less locomotive miles because of less traffic and does not indicate the effectiveness of locomotive utilization. The miles per locomotive day when confined to the number of serviceable locomotives in active use, however, indicates an improvement in that it increased from 85.1 in 1926 to 85.8 in 1927. The average mileage per passenger locomotive day was 114.4 for the first 10 months of 1927, an increase from 113.5 over the same months the preceding year and the highest ever attained for a corresponding 10 months' period.

Throughout the 10 months for which the data are available month by month, the freight train fuel record is the best ever attained, the average for the period showing a reduction per 1,000 gross ton-miles from 134 lb. in 1926 to 129 lb. in 1927. Similarly a record was made during each month of 1927 with an average of 15.2 lb. per passenger train car-mile as compared with 50.6 lb. during 1926. These factors, of primary interest to mechanical department supervisors, are typical of the improvements in practically all phases of operation. The railroads continue to render a service to the public which was never equalled in promptness and effectiveness prior to the war.

New Books

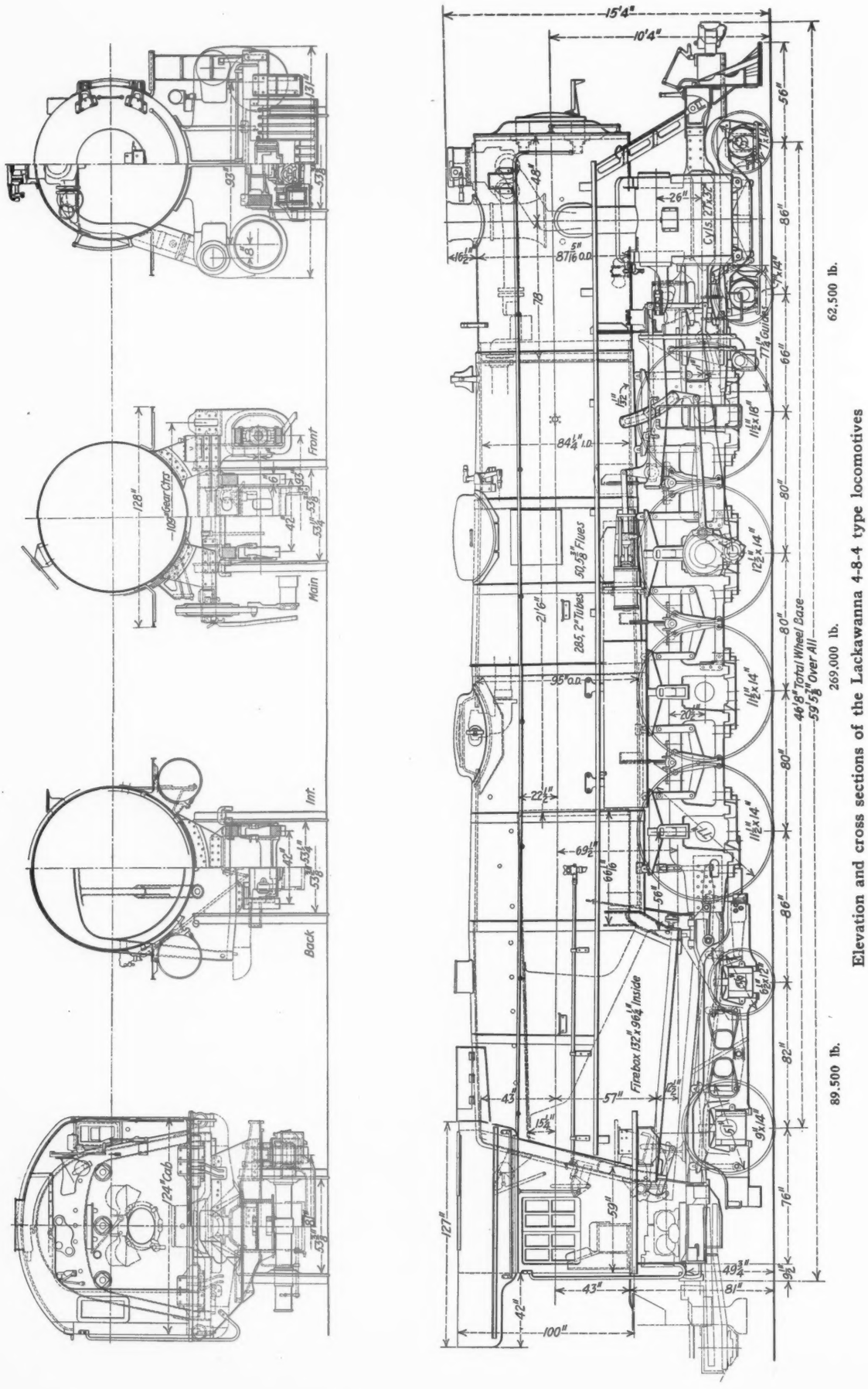
PROCEEDINGS OF THE INTERNATIONAL RAILWAY FUEL ASSOCIATION, 1927. *Edited by the secretary, L. G. Plant,* 516 *Railway Exchange, Chicago.* 494 *pages, illustrated. Price* $3.00.

This book contains the proceedings of the nineteenth annual convention of the International Railway Fuel Association which was held in Chicago, May 10 to 13, 1927. The reports submitted include inspection, preparation and analysis of fuel, storage of fuel, Diesel locomotives, stationary plants, fuel stations and firing practice. The book also contains the following papers which were read before the convention by men in the railroad field interested in fuel conservation: Operating factors in fuel efficiency; What is the real cost of locomotive fuel?; Fuel economy in long locomotive runs; Train dispatcher, his work in fuel economy; Human element in fuel efficiency; High pressure steam turbine locomotives, and Fuel fundamentals.

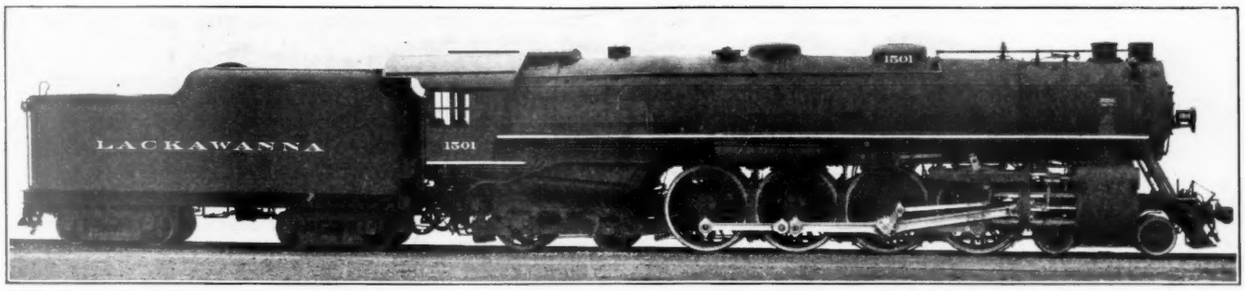
THE BRITISH STEAM RAILWAY LOCOMOTIVE. *By the late E. L. Ahrons.* 391 *pages, illustrated.* 8½ *in. by* 11 *in. Price* 30 *shillings. Published by The Locomotive Publishing Company, Ltd.,* 3 *Amen Corner, London, Eng., and by Spon & Chamberlain,* 123 *Liberty street, New York. Bound in cloth.*

The author of this book, who died March 30, 1926, is well known in the field of British railroad history, one of his earlier works being "The Development of British Locomotive Design." He has also written numerous railway historical articles for the British railway technical press.

This book covers the period of British locomotive development from 1825 to 1925. It contains numerous illustrations of both early and modern locomotives. The information given relative to the various important locomotive developments is unusually complete. The book is devoted to locomotive developments in Great Britain.



Elevation and cross sections of the Lackawanna 4-8-4 type locomotives

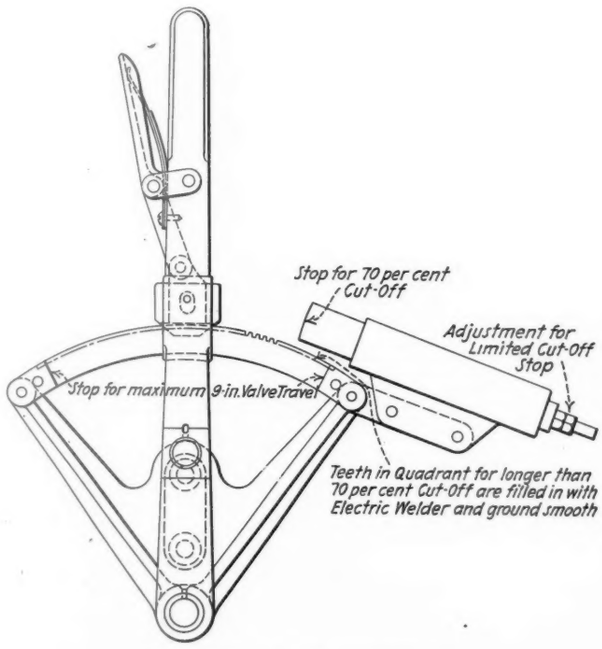


One of the 4-8-4 type locomotives built by the American Locomotive Company for the Delaware, Lackawanna & Western

Five 4-8-4 type locomotives for the D. L. & W.

Total weight on drivers, 269,000 lb.—Develop tractive force of 64,500 lb. with 77-in. drivers

THE American Locomotive Company recently delivered five 4-8-4 type locomotives to the Delaware, Lackawanna & Western for use in heavy limited passenger train service. As speed was one of the basic requirements for these locomotives, they were built with 77-in. driving wheels, instead of 69-in. or 73-in. drivers as are used respectively on the 4-6-2 type locomotives purchased by the Lackawanna in 1923 and


Stop for 70 per cent Cut-Off
Adjustment for Limited Cut-Off Stop
Stop for maximum 9-in. Valve Travel
Teeth in Quadrant for longer than 70 per cent Cut-Off are filled in with Electric Welder and ground smooth

The reverse lever arrangement

the three-cylinder 4-8-2 type locomotives delivered in April, 1925. Increased tractive force is also provided in the new power, as compared to the three-cylinder 4-8-2 type. The new 4-8-4 type locomotives develop a tractive force of 64,500 lb. as compared to 61,100 lb. for the 4-8-2. The new locomotives, which have been designated by the railroad the "Pocono" type, also exceed in tractive force, locomotives of the same type recently built by the American Locomotive Company for the Grand Trunk Western and the Northern Pacific, excluding the booster in the latter case.

The total weight of the 4-8-4 type locomotive is 421,000 lb. of which 269,000 lb. is carried on the drivers. The cylinders are 27 in. in diameter by 32 in. stroke and the boiler carries a pressure of 250 lb. This, with the driving wheel diameter of 77 in., gives a maximum tractive force of 64,500 lb. and a factor of adhesion of 4.17.

Maximum running cut-off of 70 per cent

These locomotives are built without boosters but the trailing trucks are arranged for their possible further application. The normal maximum running cut-off is 70 per cent but the Walschaert valve gear is designed for a maximum cut-off of 85 per cent which is made available for starting by a novel reverse lever arrangement on which the builders have applied for a patent. This reverse lever arrangement is shown in one of the drawings. The quadrant is only graduated to the extent of 70 per cent cut-off, the lever, however, may be moved further over to give 85 per cent cut-off, but it must be held by hand against spring compression. Release of the hand pressure immediately returns the lever to the position of 70 per cent cut-off. With this arrangement, provision has been made for the possible future application of the booster latch handle on the reverse lever.

Both the engine and trailing trucks are of Commonwealth design, the latter being of the four-wheel Delta type. The top center casting of the engine truck extends across the frames and takes some of the cylinder and frame bolts forming a construction of maximum stiffness which materially lessens the shocks on the cylinders resulting in the side movement of the engine truck and lateral motion of the front drivers. The engine truck is equipped with 33-in. rolled-steel wheels having 7-in. by 14-in. journals. The front wheels on the trailing truck are of rolled-steel 36 in. in diameter and the rear wheels are of cast steel centers, with tires

51 in. in diameter. The journals are 6½ in. by 12 in. and 9 in. by 14 in., respectively.

The maximum length of the main rod was obtained by designing the dish of the piston and cylinder heads toward the front. Floating bushings are used in the back end of the main rod and main connection in the side rods, the flanges being on the inside. The main driving boxes are of the Alco supplemental bearing type, suitable for straight axles, and all other driving box cellars are arranged for narrow grease cakes of the same size as used with similar size journals on other locomotives.

The front driving axle is arranged for lateral motion. Normalized carbon vanadium steel was used in the manufacture of the main and side rods, piston rods, eccentric rods, radius bars, combination lever, combination link and valve stems.

The bumpers are of pressed steel, U-shaped to surround a cast steel bracket which houses a Miner A-18-S friction draft gear and short shank coupler.

The boiler is of the radial stay, extended wagon top type, 84¼ in. inside diameter at the front and 95 in. outside diameter at the throat. The barrel contains 50 5⅜-in. diameter flues and 285 2-in. tubes, 21 ft. 6 in. long. A Type A superheater having 50 units is used. The firebox which is lagged and jacketed below the running board, is 132 in. long by 96¼ in. wide inside the sheets, which gives a grate area of 88.2 sq. ft. It is fitted with two Nicholson thermic siphons and a brick arch which is carried on two arch tubes and the siphons. Alco flexible staybolts are used in the throat, sides, backhead and combustion chamber of the firebox. The fuel used is soft coal fed by DuPont stokers, the engine for which is located on the locomotive.

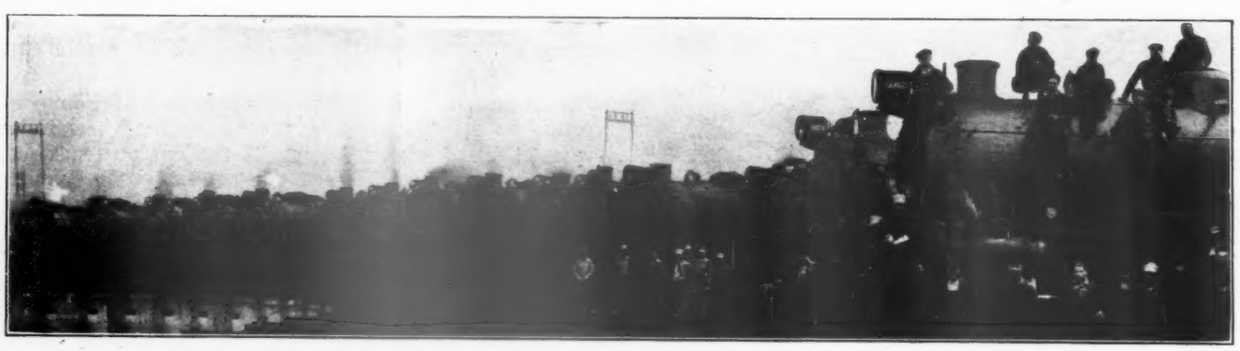
The total evaporating surface of 5,193 sq. ft. is made up of 4,700 sq. ft. in the tubes and flues, 377 sq. ft. in the firebox and 116 sq. ft. in the arch tubes and syphons. The total superheating surface is 1,324 sq. ft. making a combined evaporative and superheating surface of 6,517 sq. ft. The Chambers front end throttle valve is used in connection with the Alco compensating lever to take up expansion in the operating rod. One of the locomotives is equipped with B. & S. cylinder cocks. The boiler is equipped with a Cleveland float type low water alarm. A cut-off and back pressure gage is also provided. A Strombos air whistle is used, and it is located in the rear of the stack.

The tender

The tanks used on the tenders are of the Ralo Acme type carried on Commonwealth underframes and four-wheel trucks. The tender has a capacity of 12,000 gal. of water and 14 tons of coal. The wheels used under the tenders are of rolled steel, 36 in. in diameter and have 6½-in. by 12-in. journals.

Table of dimensions, weights and proportions of the D. L. & W. 4-8-4 type locomotives

Railroad	Delaware, Lackawanna & Western
Builder	American Locomotive Company
Type of locomotive	4-8-4
Service	Heavy passenger
Cylinders, diameter and stroke	27 in. by 32 in.
Valve gear, type	Walschaert
Valves, piston type, size	12 in.
Maximum travel	9 in.
Outside lap	1¼ in.
Exhaust clearance	None
Lead in full gear	3/16 in.
Cut-off in full gear, per cent	70 per cent
Weights in working order:	
On drivers	269,000 lb.
On front truck	62,500 lb.
On trailing truck	89,500 lb.
Total engine	421,000 lb.
Tender	216,000 lb.
Wheel bases:	
Driving	20 ft.
Total engine	46 ft. 8 in.
Total engine and tender	82 ft. 2½ in.
Wheels, diameter outside tires:	
Driving	77 in.
Front truck	33 in.
Trailing truck, front	36 in.
Trailing truck, rear	51 in.
Journals, diameter and length:	
Driving main	12½ in. by 14 in.
Driving, others	11½ in. by 14 in.
Front truck	7 in. by 14 in.
Trailing truck, front	6½ in. by 12 in.
Trailing truck, rear	9 in. by 14 in.
Boiler:	
Type	Extended wagon top
Steam pressure	250 lb.
Fuel, kind	Soft Coal
Diameter, first ring inside	84¼ in.
Firebox, length and width	132 in. by 96¼ in.
Combustion chamber, length	66 1/16 in.
Tubes, number and diameter	285—2 in.
Flues, number and diameter	50—5⅜ in.
Length over tube sheets	21 ft. 6 in.
Grate area	88.2 sq. ft.
Heating surfaces:	
Firebox and combustion chamber	377 sq. ft.
Arch tubes	28 sq. ft.
Siphons	88 sq. ft.
Tubes and flues	4,700 sq. ft.
Total evaporative	5,193 sq. ft.
Superheating	1,324 sq. ft.
Combined evaporative and superheating	6,517 sq. ft.
Tender:	
Water capacity	12,000 gal.
Fuel capacity	14 tons.
Wheels, diameter outside tires	36 in.
Journals, diameter and length	6½ in. by 12 in.
Maximum rated tractive force	64,500 lb.
Weight proportions:	
Weight on drivers ÷ total weight engine, per cent	64.1
Weight on drivers ÷ tractive force	4.17
Total weight engine ÷ total heating surface	64.5
Boiler proportions:	
Tractive force ÷ combined heating surface	9.91
Tractive force × diam. drivers ÷ comb. heating surface	76.2
Firebox heating surface, per cent of evap. heating surface	7.26
Combined heating surface ÷ grate area	73.9



Locomotives on the Ft. Wayne division of the Pennsylvania a t Crestline, Ohio, on September 22 awaiting assignment to Tunney-Dempsey prize fight trains bound for Chicago

Annual winter meeting of A.S.M.E.

Paper on heating and ventilation of passenger cars features Railroad Division program

OVER 2,400 registered as being in attendance at the annual meeting of the American Society of Mechanical Engineers which was held in the Engineering Societies building, New York, December 5 to 8, inclusive. Five papers and a report of progress in the railroad industry was presented by the Railroad Division during two sessions. A paper on "Diesel engines for Locomotives," by R. Hildebrand, chief engineer, Diesel department, Fulton Iron Works Company, St. Louis, Mo., was also presented under the auspices of the Oil and Gas Power Division. An abstract of Mr. Hildebrand's paper will appear in a later issue of the *Railway Mechanical Engineer*.

T. C. McBride, manager, locomotive feedwater heater department, Worthington Pump & Machinery Corporation, Philadelphia, Pa., presented a paper at the morning session of the Railroad Division on back pressure and cut-off adjustment for the locomotive. He discussed the subject from the operating standpoint only and gave data representing the indicated horsepower, the steam consumed and the dry coal fired as functions of the back pressure. He pointed out that for each locomotive there is a certain back pressure at which maximum power can be obtained at the lowest cost. He also proposed a method of determining the best back pressure experimentally and the use of back pressure gages for the guidance of locomotive enginemen.

One of the most timely papers on the program of the Railroad Division was on the subject of heating and ventilating passenger cars which was presented by Edward A. Russell, engineer of design, Vapor Car Heating Company, Chicago. An abstract of his paper is included in this report. A paper on safety, by Thomas H. Carrow, superintendent of safety, Pennsylvania, Philadelphia, Pa., was presented by title only. Two other papers were presented during the two sessions of the Railroad Division; one by F. J. Scarr, the Scarr Transportation Service, New York, on motor truck and l.c.l. freight, and the other by S. Timoshenko, research laboratory, Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., on the vibration of bridges.

The report on the year's progress in railway mechanical engineering was read by the chairman of the division, H. B. Oatley, vice-president, The Superheater Company, New York. In compiling data for this report, the committee obtained information concerning developments in Europe as well as in the United States and Canada. Following are brief summaries of the report of progress in railway mechanical engineering and of Mr. Carrow's paper.

Progress in railway mechanical engineering

During the past year the progress in railway mechanical engineering has been steadily toward bettering the operating efficiency of railroads by continuing the effort to increase the gross ton-miles per freight train-hour. Part of the accomplishment is due to heavier and more efficient motive power, part to improvements in signaling, heavier car loading, etc. The tendency toward higher steam pressures in locomotive boilers is going forward, the D. & H. having put in service its 400-lb. pressure 2-8-0 type locomotive, known as the John B. Jervis, and the Pennsylvania is engaged in designing a 2-10-0 type with 450-lb. pressure. Auxiliaries are operated with superheated steam; enlarged grate areas and greater firebox volumes are being used in increasing numbers, as are also feedwater heaters and exhaust steam injectors. Three-cylinder locomotives are being purchased in considerable numbers. Experiments are still being conducted with oil-electric locomotives in switching service. The Chicago & North Western has added storage batteries to reduce the weight of the primary power plant.

Indications from records covering the first half of 1927 encourage the belief that the fuel savings on locomotives will amount to approximately $17,000,000 as compared with the year 1926. The consumption per 1,000 gross ton-miles in freight service for the first four months of this year was less than for the corresponding period during the year 1926. If this rate of reduction is maintained, the 1927 figure will be 129 lb.

It was reported that radical changes were being considered by a number of technical schools in the courses of study offered to students in railway mechanical engineering. The fact was also brought out that some of the institutions formerly maintaining courses in railway mechanical engineering leading to the degree of bachelor of science, were abandoning this course and combining the more important railway subjects in the straight mechanical engineering course. It was suggested that institutions offering courses in mechanical engineering could present a better balanced course if the design and operation of motive power and rolling stock were included in the mechanical engineering curriculum.

Can accident prevention be reduced to a science?

Thomas H. Carrow, superintendent of safety, Pennsylvania, Philadelphia, Pa., presented a paper on "Can Accident Prevention be Reduced to a Science?" Mr. Carrow in his title uses an interrogation point, but his conclusion after making an exhaustive analysis of causes, is that the answer should be in the affirmative. He cites the record of the railroads, as reported by the Interstate Commerce Commission, which shows the casualties per million man-hours, as having been reduced from 30.9 in the year 1923, to 20.7 in the first half of 1927; and, moreover, this progressive improvement is very much more impressive when the figures are shown with respect to individual railroads.

Besides the humanitarian aspect of preventing death and distress, the monetary result deserves attention. On a certain trunk line railroad, the cost of injuries to employees was reduced as shown by the following striking statement:

Year 1923.....	$327,657	Year 1925.....	$133,057
Year 1924.....	185.297	Year 1926.....	82,470

Some accidents are, of course, unpreventable either by the management or the employee, and often it is not possible to determine whether the responsibility does or does not lie with the injured person. As showing how the individual character and habits of the man him-

self affect the record, the paper cites the accident records of eight men as follows:

1.	Car repairman injured.....	3 times in 26 years of service
2.	Car repairman injured.....	18 times in 9 years of service
3.	Machinist injured.....	0 time in 31 years of service
4.	Machinist injured.....	31 times in 23 years of service
5.	Freight conductor injured.....	1 time in 26 years of service
6.	Freight conductor injured.....	11 times in 20 years of service
7.	Locomotive engineer injured.....	0 time in 26 years of service
8.	Locomotive engineer injured.....	7 times in 33 years of service

Mr. Carrow estimates that 10 per cent of all injuries to employees may be classed as unpreventable, and five per cent as due to physical conditions, leaving 85 per cent which he charges to the human element. In a list of the advantages of accident prevention, he includes the forestalling of burdensome legislation, as one item; the public ultimately demands a reasonable standard of safety, if such is not voluntarily provided. One of the items under the head of cost is the expense of breaking in new men, which is estimated at from $50 to $250 per man.

Following is an abstract of Mr. Russel's paper:

Heating and ventilation of passenger cars

By Edward A. Russell

Engineer of design, Vapor Car Heating Company, Chicago, Ill.

All exhaust ventilators now in use vary in capacity according to train speed. This variation is admittedly too great as between a car at high speeds and one standing still. It is also a fact that in passenger cars, even at reasonably high speeds, there will be "dead-air" spots, generally about midway between the floor and deck, and at either side of the aisle, in an open-body car. The regulation of the exhaust capacity and the maintenance of a continuous and uniform change of air throughout the car, regardless of train speed or of wind direction and velocity, would result in increased comfort and economy.

The number of ventilators to be applied to a car should be determined by the capacity of the ventilator and the maximum number of occupants to be carried. The Master Car Builders' Association report and recommendations in 1908 showed that 1000 cu. ft. of fresh air should be supplied per hour for each passenger.

The present overheated and stuffy condition often present in cars standing at stations, can best be overcome by an arrangement whereby steam will be automatically shut off and a forced ventilation simultaneously begun whenever cars come to a stop. This could be further developed so that the amount of forced ventilation would be automatically controlled by train speed.

An efficient ventilation and heating system requires sufficient fresh air admitted by proper intakes, uniformly warmed by an easily regulated or automatically operated heating system, thoroughly circulated for the comfort of occupants, and exhausted by properly regulated mechanical means.

The heating of passenger cars has recently received special attention because of the difficulties that have been introduced by the advent of larger locomotives and the hauling of very long passenger trains. The increase of steam pressures necessary for car heating has rendered rubber hose unsatisfactory and uneconomical for steam connections between cars. Where rubber steam hose is used, a maximum of 10 to 12 cars can be satisfactorily heated. In severe weather it is the practice on some roads to remove the steam hose, particularly on head-end cars, at the end of every trip and replace it with new hose, in order to avoid train delays due to burst steam hose.

A most timely editorial appeared in the Railway Age, January 8, 1927, entitled "Car heating both difficult and expensive," in which it was stated that "tests have shown that a modern steel passenger car can be heated with about 2.85 lb. of steam per hour per degree difference in internal and external temperatures. This difference may reach 75 deg. or more, and in a 15-car train, therefore, 3,200 lb. of steam per hour are required, or roughly eight per cent of the locomotive boiler capacity . . . A passenger car is essentially a room on wheels with a large proportion of window area, and exposed on all sides; and passes at high speeds through blizzards and sleet storms, and all kinds of inclement weather."

At the close of this editorial this very significant statement was made: "The flow of steam through two-inch pipe in train line is restricted in most cases, owing to the use of couplings between cars with only 1⅜-in. openings."

In a later editorial (March 12, 1927), on "Heating Long Passenger Trains," the Railway Age stated that "with a maximum train-line pressure of 130 lb. at the reducing valve, it has been found impossible to heat the rear cars of a 15-car train to anywhere near 70 deg. Under these conditions, it has been found necessary to have the initial train-line pressure materially higher to supply steam fast enough to be carried back to the rear car of such a train. The utilization of high steam-line pressures presents a number of difficult problems in design, maintenance, and operation that can only be solved by considerable study and experiment."

These two editorials indicate the problems that have to be met in car heating.

Car heating requirements

Essentially there are three requirements for ideal passenger car heating: Sufficient volume and pressure of steam supply from locomotive for the adequate heating of every car in train; full-area steam passage through connections between cars, with minimum friction and freedom from leaks; and correct amount, distribution, and regulation of heating surface in each car to heat the car economically and satisfactorily under all conditions.

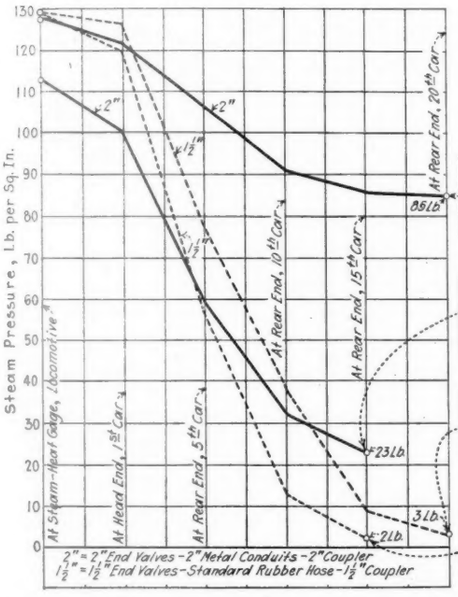
Locomotive equipment

For a number of years a 2-in. steam train line has been used under passenger cars, but the source of supply from the locomotive boiler is still restricted to a 1½-in. outlet at the stop valve, with even smaller area for the steam passage through the valve. This restriction necessarily retards the volume flow of steam to meet car-heating demands in severe weather, particularly on long trains. The use of a 2-in. stop valve, preferably of the angle type, constructed so that the valve seat lifts free from the path of the steam, will provide a greater amount of steam for car-heating purposes.

Essentially, then, this area should be maintained in reducing-valve connections in all steam-heat piping on the engine and in all steam-heat connections between the engine and tender. Tests made by one of the large railroads, using a 2-in. stop valve and a 2-in. pipe to reducing valve, showed pressures at the reducing valve to be more than 10 per cent higher than those where a 1½-in. stop valve and pipe were used with the same boiler pressure. It is important that the full area be obtained at the boiler outlet to the steam-heat line, and that the steam-heat piping on the locomotive be properly protected with covering.

Of more importance than is often recognized is the pressure-reducing valve used in the steam-heat line on locomotives. The length of train and varying outside temperatures determine the pressure and volume of

steam required for car-heating purposes. Considering the maximum steam requirements for car heating, possibly eight per cent of the boiler capacity, it is important that the reducing valve should permit economy in steam consumption under other than the maximum requirements. The pressure-reducing valve, therefore, should be capable of adjustment to any desired pressure, and should maintain that pressure without fluctuation. A most important feature in the operation of locomotive pressure-reducing valves is the item of maintenance cost and the delay to the locomotive while making repairs.


Steam Pressure, Lb. per Sq. In.
At Steam-Heat Gage, Locomotive
At Head End, 1st Car
At Rear End, 5th Car
At Rear End, 10th Car
At Rear End, 15th Car
At Rear End, 20th Car
2"
1½"
86 Lb.
23 Lb.
3 Lb.
2 Lb.
2" = 2" End Valves - 2" Metal Conduits - 2" Coupler
1½" = 1½" End Valves - Standard Rubber Hose - 1½" Coupler

COMPARISON TABLE

	Average outside temperature, deg. fahr.	Average pressure drop per car, lb.	Time to get steam to rear, minutes	Average car temperature, deg. fahr.	Average speed, miles per hr.	Number of deck sash open	Number of intakes open
Standing test, 20 coaches, 2" vapor conduits	3	2 1/8	4 2/3	69	—	—	—
Running test, 15 coaches, 2" vapor conduits	9	6	5 1/4	67	33.6	1/2	1/2
Standing test, 20 coaches, 1½" rubber hose	23	6 1/4	29 1/2	70	—	—	—
Running test, 15 coaches, 1½" rubber hose	13	8 1/3	9 1/2	67.5	35.7	1/2	1/2

Fig. 1—Variation in steam pressures at different parts of a 20-car train with 2-in. and 1½-in. connections

This has been successfully overcome by the adoption on many roads of a reducing valve so constructed that the cylinder walls and piston (the principal parts which wear or "wire-draw") may be quickly renewed without removing the valve from the pipe connections.

With present pressure requirements on steam-heat lines, rubber steam hose cannot be successfully used between the engine and tender and at the rear of the tender. With locomotives thus equipped, including all 2-in. piping and connections on tender, a higher pressure is available for car-heating purposes.

Connections between cars

The necessity for a full 2-in. steam passage through end valves, metallic conduits (used instead of rubber hose, which is not practical for high pressures), and couplers between cars has been proved by 41 tests.

As far back as 1922 it was demonstrated in actual service tests that when changing engines at terminals, steam would pass to the rear of a train equipped with 2-in. connections between cars in less than one-half the time required in a train equipped with 1½-in. connections between cars.

Last winter, one railroad, in an effort to heat long trains of 18 to 20 cars, removed the reducing valve from the locomotive and applied armored steam hose to all cars so that full boiler pressure would be available for car heating; but even with this arrangement the rear cars could not be heated in severe weather. Two-inch end valves and 2-in. metallic conduits were applied, leaving the 1½-in. couplers which have only a 1⅜-in. gasket opening. However, to heat the rear cars satisfactorily in extreme weather it was found necessary also to apply 2-in. couplers.

Another recent test indicated a pressure drop through the equivalent of five cars equipped with 1½-in. end valves, rubber hose, and couplers which was 50 per cent greater than with the 2-in. connections between passenger cars.

It has been found, where 2-in. metallic conduits are applied, that the saving in cost of steam-hose renewals over a period of two heating seasons in northern climate will more than cover the entire expense of the metallic conduits. Further maintenance economies will result from the use of metallic conduits constructed so that the gaskets and any other parts requiring renewal can be changed without special tools and without removing the conduits from the cars; and by the use of gaskets with long life—made possible by arranging the conduit so there is no weight or strain on the gasket under any condition of service.

Table 1—Data compiled from running tests made during the winter of 1926-27

Connections[1] between cars	Outside temperature, deg. fahr.	Average speed, m.p.h.	Pressure at steamheat gage on loco.	Average car temperature, deg. fahr.	Average drop in pressure head end of first car to rear of— 5th car	10th car	15th car	Average pressure at 15th car lb. per sq. in.
With 15 Steel Coaches								
2-in. metallic	—9	34	113	66	42	69.2	77.3	23.2
1½-in. and hose	10	36	129	67.5	63.4	106.8	116.8	2.6
With 15 Steel Sleeping Cars								
2-in., metallic	25	33	128	69.5	50.5	88.5	97.9	15.9
1½-in. and hose	13	39	147	59	69.2	114.5	125.8	0.0

50 per cent of ventilators open; from none to 50 per cent of intakes open, as required.

[1] Two-inch metallic: 2-in. end valves, 2-in. metallic conduits, and 2-in. steam couplers. 1½-in. and hose: 1½-in. end valves, 1½-in. standard steam hose, and 1½-in. couplers.

Tests conducted in 1920 by the Montreal Air Brake Club showed a pressure loss between the reducing valve and the rear of tender of 13 per cent with standard 1½-in. steam hose between the engine and tender, and a pressure loss of 5 per cent with 2-in. metallic connections. Flexible metallic connections for this service should adapt themselves to any motion in service without restricting the steam areas.

One railroad made a very exhaustive test last winter, with 20 cars standing in yards and with 15 cars in train service, to compare the results obtained by using 1½-in. connections (end valves, rubber hose, and couplers) and 2-in. metallic connections between cars. Fig. 1 and Table 1, compiled from this test, show conclusively the desirability of equipping locomotives and passenger cars with 2-in. steam-heat connections throughout.

Radiating surface in cars

There is a special field for electric and hot-water heating systems. In strictly suburban service electrically operated cars are heated by electricity, although an electric heating system is more expensive to operate than a steam heating system. For main-line passenger cars, even where hauled by electric locomotives, the use of steam is far more economical, more flexible in regulation, and more desirable.

The use of pressure steam-heating systems has been discontinued. They are neither safe in case of breakage of radiating pipes from any cause, nor economical in steam consumption. With pressure systems the cars in the head ends of trains were always overheated, and the traps were frequently frozen. While steam under pressure has a higher temperature, the difference is of no advantage in comparison to the objections and troubles arising from the use of pressure heating systems.

In calculating the radiating surface required for a passenger car there are many conditions that must be considered, such as the kind of car, its construction, the tightness of windows and doors, the minimum outside temperatures encountered, and the maximum inside temperature required. There are definite heat losses to be figured. These vary somewhat, depending on methods followed in construction. Formulas for figuring the conductivity of walls, floors, etc., of different materials and insulations, were given in a paper by K. F. Nystrom of the C. M. & St. P. presented at the February, 1924, meeting of the Canadian Railway Club. This paper also indicated the usual heat losses in steel passenger cars.

The total amount of radiating surface required in a steel passenger car is generally based on the ratio of one square foot of heating surface to 13 cu. ft. of space inside the car. This, of course, assumes that the car is properly insulated.

A heating system for passenger cars must be arranged to warm the car under all conditions of outside temperature, which, during a single trip on some roads often range from below zero to a point requiring no heat whatever. This necessitates extreme flexibility in methods of controlling inside car temperatures.

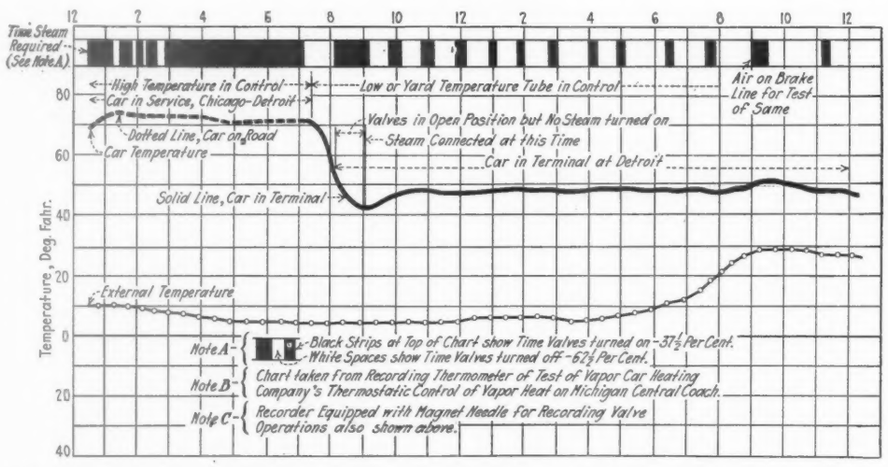

12 2 4 6 8 10 12 2 4 6 8 10 12
Time Steam Required (See Note A)
High Temperature in Control
Car in Service, Chicago-Detroit
Low or Yard Temperature Tube in Control
Air on Brake Line for Test of Same
Valves in Open Position but No Steam turned on
Steam Connected at this Time
Dotted Line, Car on Road
Car Temperature
Car in Terminal at Detroit
Solid Line, Car in Terminal
External Temperature
Temperature, Deg. Fahr.
80
60
40
20
0
20
40
Note A - Black Strips at Top of Chart show Time Valves turned on - 37½ Per Cent.
White Spaces show Time Valves turned off - 62½ Per Cent.
Note B - Chart taken from Recording Thermometer of Test of Vapor Car Heating Company's Thermostatic Control of Vapor Heat on Michigan Central Coach.
Note C - Recorder Equipped with Magnet Needle for Recording Valve Operations also shown above.

Fig. 2—Comparison from tests of steam required in service and at terminals by a car equipped with double-automatic control vapor system

(For a car in service, valves are on 90 per cent of the time; when the car is idle, the valves are on 23 per cent of the time.)

Automatic temperature regulation

In the development of automatic temperature regulation for passenger-car heating the paramount consideration has been its resulting economy to the railroads. Normally a passenger car is in train service only one-third of the time. On some roads the average is more, and on some roads less. It is therefore important to avoid all unnecessary waste of steam by the usual overheating of cars lying over at terminals approximating two-thirds of the time.

There is no necessity for maintaining in cars in terminal yards the temperatures required in service. A 50-deg. car temperature in yards will prevent freezing of toilet water and permit cleaning and other work inside the car without discomfort. Such temperatures can be maintained at terminals by automatic regulation.

To maintain by automatic means a temperature of 50 deg. in cars in terminals for two-thirds of the time, and, say, 70 deg. in service for one-third of the time, requires the use of two thermostats, each made to operate at the predetermined temperature, one for terminal control and on for service control.

The requirements of an automatically regulated vapor system are as follows:

It must retain the "short-circuit" principle of the manually operated vapor system in order to prevent freezing, etc.

It requires a double thermostat properly located in the car.

It must be designed to change automatically from the 50-deg. terminal-control thermostat to the 70-deg. service-control thermostat, or vice versa, without any manual attention. This is accomplished by the use of an air-operated contact switch arranged so that the presence of air in the brake train line will put the 70-deg. or service thermostat in control of the heating system, while the absence of air in the brake line will put the 50-deg. or terminal thermostat in control.

It must be arranged so that the 70-deg. thermostat can be put in control manually when it is necessary to heat cars for occupancy and there is no air in the brake line, at the same time not affecting the automatic change from 70 to 50 deg., or vice versa, when air has again been connected to the brake line.

With the possible maximum use for car heating of 8 per cent of the total steam generated by the locomotive, it is very essential that every economy be made in heating passenger trains. An automatically regulated vapor system will maintain uniform temperatures in train service, increasing the comfort of the traveling public, and will effect considerable economy in actual steam consump- will also eliminate unnecessary waste of steam consump-

tion. It will also eliminate unnecessary waste of steam in heating cars at terminals.

Fig. 2 shows the result of a 24-hr. test, both in service and at the terminal, of one car equipped with an automatically regulated vapor system. It will be noted that in service, with an average outside temperature of 6 deg., a uniform temperature was maintained in the car and steam was actually shut off automatically for 10 per cent of the time. In the terminal, steam was shut off 77 per cent of the time.

The saving in steam and coal consumed in heating passenger cars at terminals is further emphasized by a test made at a Chicago passenger terminal of two 70-ft. steel passenger coaches, identical in construction and in the arrangement and amount of radiating surface, quoted below:

Both cars had arrived in the same train, and inside temperatures were the same at beginning of test.

Ventilators of both cars open; vestibule doors adjusted similarly; temperature readings taken, and all condensation measured at frequent and regular intervals.

Steam supplied both cars from same source, through a tee-connection.

	Automatic-control car	Uncontrolled car
Outside temperature, 26 deg. F.	....	.....
Average inside temperature maintained during "lay-over," deg. F.	53	83
Percentage of time steam was used in radiating pipes	18	100
Average condensation, lb. per hr.	33.35	124.76
Average saving condensation, lb. per hr.	91.41	.....
Or approximately	14 lb. coal per hour	
Total saving per car per year	40,000 lb. (20 tons) coal	

Also approximately 37,000 gal. of water.

(Above total saving based on the fact that passenger cars lie over at terminals or in yards practically two-thirds of the time, and allowing 188 days out of each year during which steam would be required in yards.)

Condensation from the yard line drained before steam entered either car.

One car operated continuously under double automatic control vapor system, with the 50-deg. or "lay-over" thermostat in control.

Other car, similarly equipped, had the automatic control feature cut out, and was operating continuously with all valves in the "On" position or wide open, the usual way of heating "lay-over" cars.

In spite of numerous tests that have been made to determine the actual or average steam consumption required to heat passenger cars both in train service and at terminals, it may be said that no formula has been developed that will be accurate under all conditions.

Theoretically, approximately three pounds of steam per car-hour will be required for each degree of temperature difference to be maintained between outside and inside for an ordinary steel passenger car.

The diversity in types of car, their methods of construction and insulation, interior arrangements, number of exposed outlets of heating system, direction and velocity of wind, all affect the condensation of steam for car heating.

An important factor is the speed of train which automatically increases the amount of air exhausted through ventilators. As an indication of the relative increase in condensation with increased speed of train, note the following result of test made:

Outside temperature deg. Fahr.	Pressure at steam-heat gage, lb. per sq. in.	Pressure at rear of 11th car:	
		At 40 m.p.h., lb	At 60 m.p.h., lb.
27	110	40	30
—8	110	30	15

During a test of a train in which all the cars were equipped with automatically regulated vapor system, it was found that as the thermostats in the cars automatically closed the admission valves and cut out steam from the heating coils inside the cars, train-line pressures increased. In one instance, presumably the result of thermostats in all cars shutting off steam about the same time, the pressure at the rear of the last car increased 25 lb. in 10 min.

Proper insulation of all exposed piping and connections underneath the car will of course, aid the reduction of condensation in severe weather and at high speeds.

Discussion

One of the speakers referred to a number of heating tests made in January, 1927, by an eastern railroad with passenger car trains varying from 15 to 20 cars. In these tests both the 1½-in. and 2-in. equipment were tried out. With the 1½-in. equipment, steam appeared at the rear end of the twentieth car in about 30 min., while with the 2-in. equipment and with the same inch of water pressure delivered to the train, the steam appeared at the rear car in 3¾ min.

The question of more adequate insulation was brought up by another speaker, especially the connections between the cars. It was observed in the tests referred to that when the train was running over track pans that the splashing water caused a depreciable drop in the flow of steam through the train line and an equilibrium of pressure was not reached until after the track pans had been passed. He said that it was found to be uneconomical to increase the thickness of the insulation over one inch. Furthermore, it was found to be impossible to insulate more than 30 per cent of the exposed surface between the two ends of the train line. He suggested that considerable study should be given to the subject of insulation and also the insulation of metallic conduits.

One of the speakers asked to what extent superheated steam had been used for car heating. In reply to this question, another speaker said that the Long Island had been using superheated steam for a number of years and that it had reported some very satisfactory results both as to the saving of fuel and in the more constant heating of cars. Some of the railroads in the northwest are also considering the use of superheated steam on their long transcontinental trains having from 15 to 18 cars, and operating in temperatures as low as 30 and 40 deg. below zero. It is believed, he said, that the entire train can be heated by the use of superheated steam and thus avoid the necessity of using individual car-heating equipment in the last four or five cars of the train. In reply to the discussion on the use of superheated steam, Mr. Russell said that 200-lb., 600-deg. superheated steam have 121 B.t.u. in addition to saturated, which would affect a gain of probably eight per cent. Some of this gain would, no doubt, be lost through radiation due to the increased velocity of the superheated steam and the additional fuel required for superheating.

Engine truck box used on the St. L.–S. F.

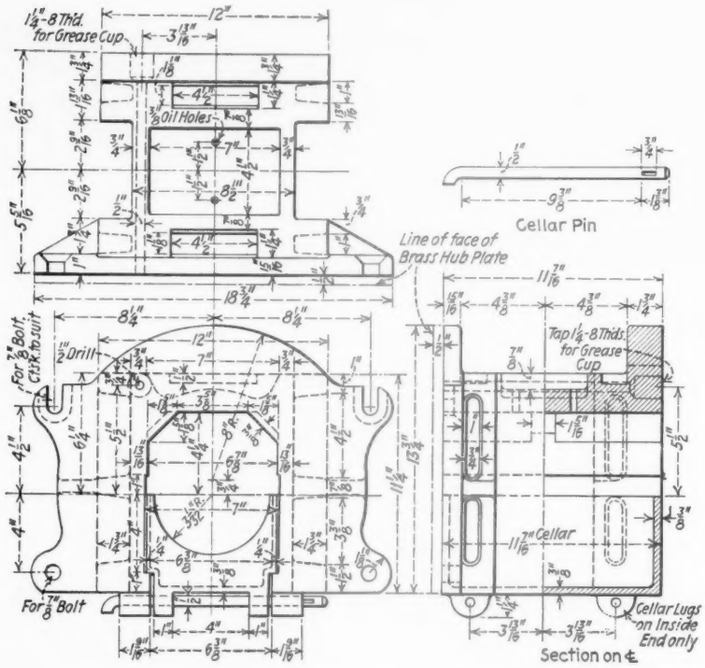
THE engine truck box with the removable lateral liner shown in the drawings is in general use on four-wheel engine trucks, two wheel engine trucks and trailer trucks on the heavier class locomotives of the St. Louis-San Francisco. The feature in the design of this box is the brass lateral liner which can be removed when worn down to a minimum thickness without removing the box. These liners are brass castings, the dimensions and detail design of which are shown on one of the drawings. The face of the truck journal box is designed to extend beyond the wearing surface of the

hub to permit securing the lateral liner or hub plate to the face with four 7/8-in. bolts.

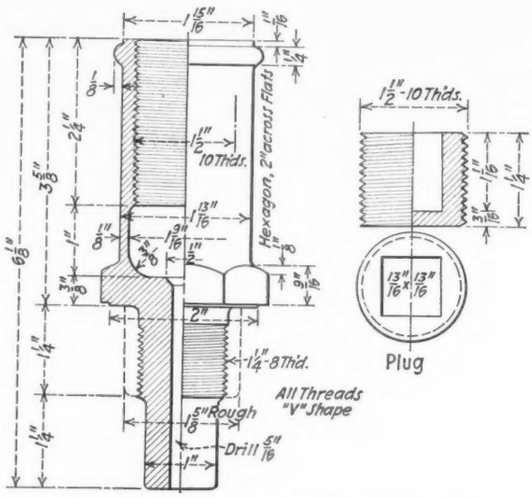
It will be noted that the lateral liners are provided with grease cavities, one of the top cavities being fed by grease from a cup located at the back of the box. The design of the grease cup used to lubricate this type of lateral liner is illustrated. The grease cup is of malleable iron, and is designed so that the end of the 5/16-in. hole of the cup makes a tight fit with the 1/2-in. hole extending through the box to the grease cavity in the lateral liner. Grease is forced through to the hub plate by screwing down the plug which is designed to take a 3/4-in. socket wrench.

One of the drawings shows the method of applying the removable lateral liner to a truck journal box which was originally provided with a babbitted hub. A 1/2-in. steel reinforcing plate is secured to the face of the box by four 7/8-in. cap screws the heads of which are countersunk in the face of the steel reinforcing plate. The lateral liner is bolted to the steel reinforcing plate by four 7/8-in. bolts fitted with castle nuts which are prevented from turning by a 1/4-in. cotter.

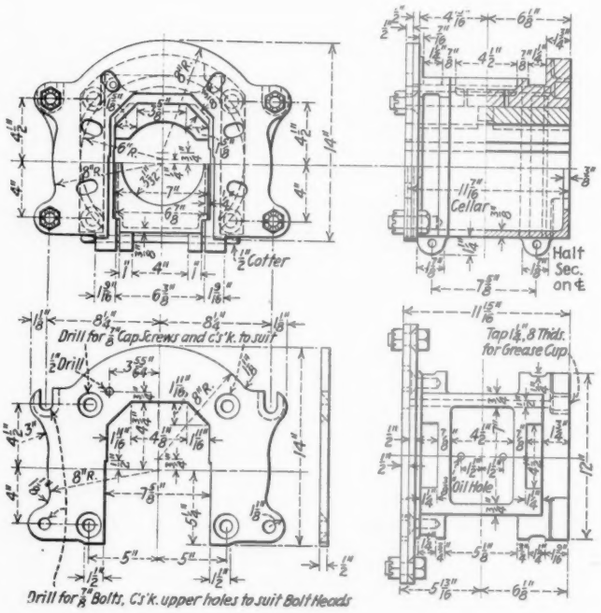
Considerable saving of scrap brass is effected by making the lateral liners of that material. Practically the same methods can be used in the renewal of these liners as are commonly used in the renewal of connecting rod bushings. The only metal lost is that which is actually worn away. Considering the scrap value of the worn liners removed from the engine and trailing truck journal boxes, the cost of taking up the lateral on these trucks is considerably lower than the casting of anti-friction metal directly on the face of the locomotive driving boxes.



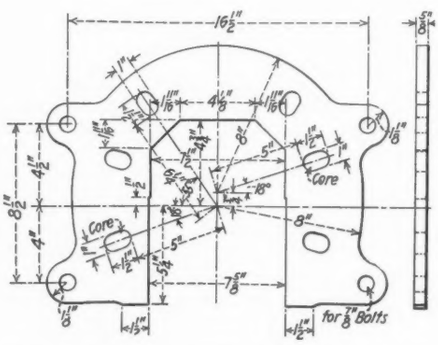
Design of engine truck box with removable lateral liner



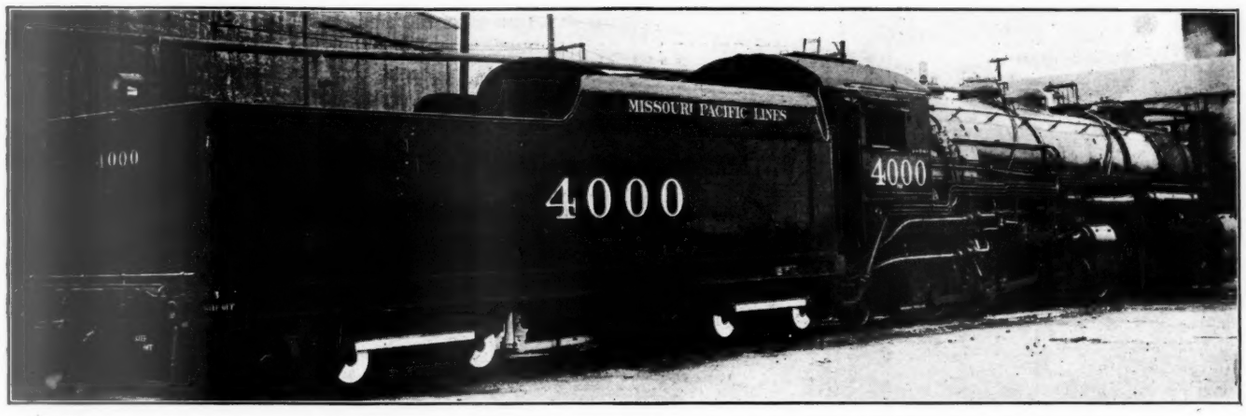
Grease cup used for lubricating the engine and trailer truck lateral liner


Cellar
Halt Sec. on ℄
Tap 1 1/4"-8 Thds. for Grease Cup
Drill for 7/8" Cap Screws and C's'k. to suit
Drill for 7/8" Bolts, C's'k. upper holes to suit Bolt Heads

Application of removable lateral liner to box originally provided with a babbitted hub



Detail of the removable brass lateral liner



Mallet locomotive with large capacity tender and six-wheel power tender trucks used at the Missouri Pacific hump yard, Dupo, Ill.

Double power tender trucks on M. P.

Application to large power in heavy hump yard service shows a number of important advantages

DURING the early part of 1927, the Missouri Pacific was faced with the problem of providing additional unit motive power capacity to meet the demands of heavy duty hump yard switching service at Dupo, Ill., and it was decided to secure this increased capacity by the application of steam driven power trucks under the tenders. A 2-8-8-2 type and a 2-10-2 type locomotive were accordingly selected and equipped with new large capacity tenders, each having two six-wheel power tender trucks, or auxiliary locomotives as they are known, furnished by the Bethlehem Steel Company, Bethlehem, Pa. These trucks have 10-in. by 12-in. cylinders, 36-in. wheels and a gear ratio of 2.25, but in this case, each truck has six wheels, four of which transmit power. With the installation of these trucks the Missouri Pacific becomes the first railroad to propose and place in service two six-wheel auxiliary locomotives under one tender.

Dupo yard, the classification terminal for the Illinois division of the Missouri Pacific embracing the Southern Illinois coal mining district, is subject to peak movements over long sustained periods during the coal loading season. The northbound movement over the hump consists of heavy coal trains from the South, and the gradient in this movement ranges from .17 per cent at the foot to 2.2 per cent at the apex of the hump. The southbound movement consists of merchandise load and empty coal cars for the South, and the gradient in this movement ranges from zero at the foot to 2.3 per cent at the apex of the hump.

Two solutions of the problem

Two ways were open to secure an increase in the number of cars handled over the hump: First, increase the trackage facilities on the hump, which was not desirable and which would seriously hamper switching operations while construction was under way; and second, secure additional capacity in the pusher locomotives serving the hump, which would considerably increase car handlings and would also result in economies in operation due to faster movement of cars to the point where hump switching began.

The second way was decided to be the one most suited to the local operating needs. Locomotive 4000 having the following characteristics was selected to handle the movement on the northbound hump:

Type	Mallet
Wheel arrangement	2-8-8-2
Weight on drivers	414,800 lb.
Weight on truck	18,600 lb.
Weight on trailer	19,600 lb.
Weight on engine	453,000 lb.
Weight of tender	305,500 lb.
H.P. cylinders, diam. and stroke	26 in. by 32 in.
L. P. cylinders, diam. and stroke	40 in. by 32 in.
Diameter, drivers	55 in.
Diameter, engine truck wheels	30 in.
Diameter, trailer wheels	30 in.
Diameter, tender truck wheels	36 in.
Tractive force	94,400 lb.
Boiler pressure	200 lb.
Grate area	84.8 sq. ft.
Firebox, width and length	96 in. by 126 in.
Heating surface, superheater	890 sq. ft.
Heating surface, firebox	252 sq. ft.
Heating surface, tubes	3,216.2 sq. ft.
Heating surface, flues	1,088.56 sq. ft.
Heating surface, feed water heater	1,240 sq. ft.
Heating surface, arch tubes	32 sq. ft.
Heating surface, total	5,828.76 sq. ft.
Fuel	Coal

Locomotive 1729 having the following characteristics was selected to handle the movement on the southbound hump:

Type	Santa Fe
Wheel arrangement	2-10-2
Weight on drivers	329,500 lb.
Weight on truck	29,350 lb.
Weight on trailer	60,100 lb.
Weight of engine	418,950 lb.
Weight of tender	305,500 lb.
Cylinders, diam. and stroke	30 in. by 32 in.
Diameter, drivers	63 in.
Diameter, truck wheels	33 in.
Diameter, trailer wheels	43 in.
Diameter, tender truck wheels	36 in.
Tractive force	81,600 lb.
Boiler pressure	210 lb.
Grate area	88 sq. ft.
Firebox, width and length	96¼ in. by 132¼ in.
Heating surface, superheater	1,285 sq. ft.
Heating surface, firebox	265 sq. ft.
Heating surface, tubes	3,120 sq. ft.
Heating surface, flues	1,466 sq. ft.
Heating surface, siphons and arch tubes	105 sq. ft.
Heating surface, combustion chamber	120 sq. ft.
Heating surface, total	5,076 sq. ft.
Fuel	Coal

After a careful study of the conditions and requirements for steam used by the engine and auxiliary locomotives, a check of the boiler capacity was made and it

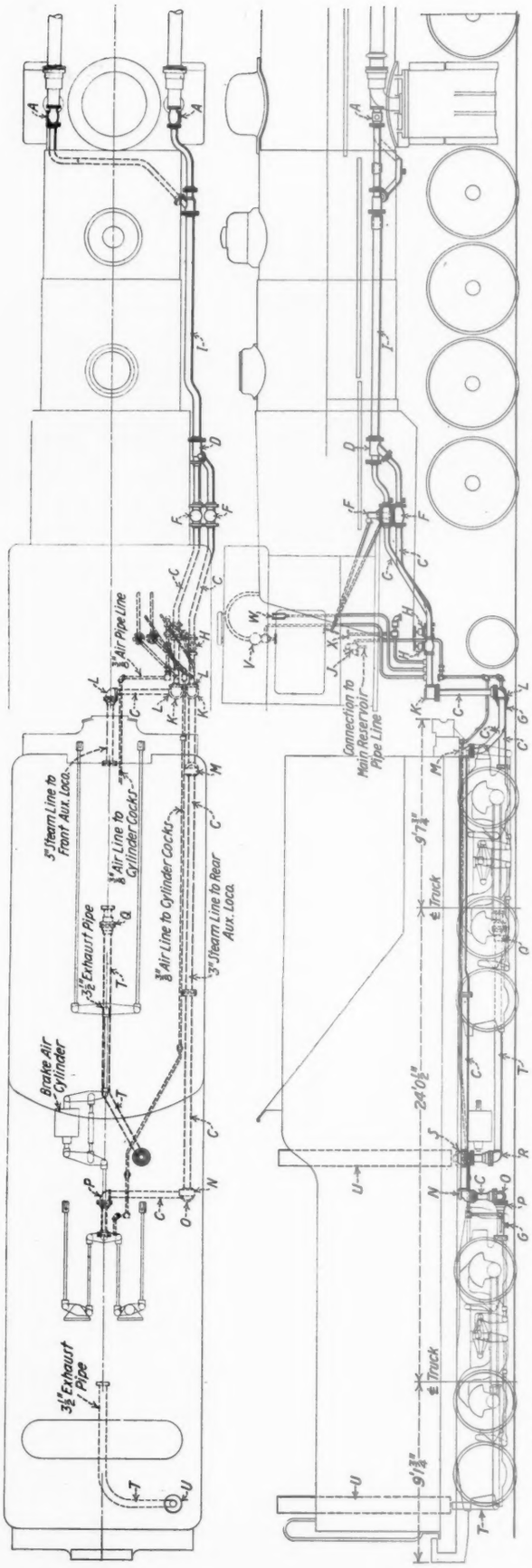


Diagram showing the piping arrangement used with the double power tender truck installation on Missouri Pacific Mallet Locomotive No. 4000

was found that the present boilers would be able to supply enough steam for the two additional engines in addition to that required for the main locomotive, without any change, as it is not necessary for both of these auxiliary engines to be cut in for any great length of time.

New tenders built for both locomotives

New tenders were built for both locomotives, each having a capacity for 18 tons of coal and 14,000 gallons of water. They were equipped with Bethlehem auxiliary locomotives on both the front and rear trucks which increased the available tractive force on each locomotive as follows: The tractive force of locomotive No. 4000, which carries 200 lb. steam pressure, was raised from 94,400 lb. to 122,400 lb., or an increase of 28,000 lb. The tractive force of locomotive No. 1729, which carries 210 lb. steam pressure, was raised from 81,600 lb. to 111,600 lb. or an increase of 30,000 lb.

These two locomotives are now operating on the Dupo, Ill., hump, and although complete figures on their performance are not yet available due to the fact that traffic from the Southern Illinois coal fields has not been of sufficient volume thus far to permit operation at maximum capacity over a 24-hour period, the locomotives have demonstrated conclusively their ability to handle increased tonnage on the hump and have more than met expectations along this line.

Locomotives of similar class to locomotive 1729 have a capacity of 3,000 actual tons in a southward movement over the hump. Since the application of double-power tender trucks Locomotive No. 1729 has demonstrated its ability to handle a train of 6,011 actual tons, consisting of 86 loads and three empties on a southward movement over the hump.

Tractive force increased

While the available tractive force of locomotive No. 4000 was increased approximately 30 per cent and on locomotive No. 1729 approximately 37 per cent, the capacity of both locomotives in tons handled over the hump increased 50 per cent. This is due to the longer trains which permit the locomotive and some of the cars to be on the level or on a very light grade at the bottom of the hump, at the time the first cars are being pushed over.

In the past, during the coal loading season, it has been necessary in order to handle the entire train brought into the yards by the road engine to use a helper locomotive for 24-hour service on the hump, or else take the trains up in two cuts which caused considerable congestion in the yard.

Both locomotives No. 4000 and No. 1729 have demonstrated their ability to take the heaviest trains brought into their yards over the hump without helper service, which will effect considerable economy on account of elimination of helper engines.

Special tender underframes—Piping

The tender underframes were especially developed by the Commonwealth Steel Company, St. Louis, Mo., to accommodate this double installation and the tenders were built new by the Missouri Pacific with the idea in mind of providing sufficient water capacity to keep the locomotives in service during the full eight-hour shift. The piping application consists of a single pipe line running from suitable connections to the right and left steam pipes back to a Y-fitting at the forward end of the firebox and then branching into two independent 3-in. steam lines extending further back to the auxiliary locomotives. Two special Bradford throttle valves with a

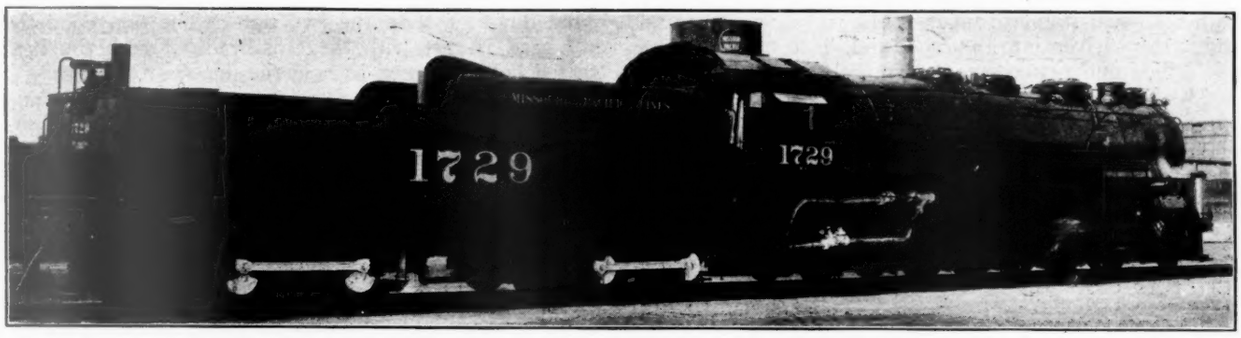
single operating handwheel conveniently placed in the locomotive cab control the flow of steam. Gate valves permit shutting off steam to either line should the operation of one of the auxiliary locomotives be undesired for any reason.

The piping under the tender consists of the two 3-in. steam lines suitably connected from the steam pipe leads on the locomotive to the auxiliary engine on each of the trucks.

Two 3½ in. exhaust pipes conduct the exhaust steam from these engines to two lengths of 10-in. vertical steel pipe which serve both as up-takes through the body of the tank and as mufflers. In order to provide complete flexibility of the tender trucks in negotiating curves 3-in. Barco flexible joints, especially designed for this installation, are provided. In the exhaust lines, flexibility is secured by the use of 3½-in. Barco joints, also of special design. The two ⅜-in. air lines to the cylinder cocks are also provided where necessary with flexible metallic joints. In addition to the provision of air-operated cylinder cocks in the auxiliary locomotive cylinders, automatic drip cocks located at the lowest points in the steam lines serve to release condensed water. All of the large piping used is of extra heavy weight. Valves and fittings are designed for high pressures. Steam lines are carefully lagged.

Operation is readily controlled

The operation of the auxiliary locomotives is wholly under the control of the engineman, approximately two turns only of the special throttle valve handle being required for complete throttle opening. The auxiliary locomotive automatically goes into engagement upon the opening of the throttle valve and disengages upon the closing of the throttle valve, a feature which makes its operation and control comparatively simple.



Santa Fe type locomotive equipped with six-wheel power tender trucks and used in heavy switching service at the Dupo, Ill., yard of the Missouri Pacific

Securing crossheads to piston rods without using keys

Failures attributed largely to the weakening effect of keyways that reduce the cross sectional area of the rod

By a general foreman

MODERN heavy power is mostly equipped with 5-in. carbon vanadium steel, heat treated piston rods. The keyways almost cut the rods in two at a point where all the strength possible is needed. The heavy sledging of the keys in the enginehouse causes minute fractures that eventually result in failures. It is almost universal practice to connect the piston rods to the crosshead by driving a key into a keyway. Apparently no effort has ever been made to change this method of attachment. After examining many broken piston rods, the thought occurred that the design of the method of fastening the piston rod to the crosshead could be improved by eliminating keyways and keys. The eight methods of attaching a piston rod to a crosshead without using keys are not submitted as complete ideas but for the express purpose of stimulating thought on the problem, and possible submission through the medium of the *Railway Mechanical Engineer* of additional methods of securing these two parts together.

Eight methods of securing piston rods without keys

Method No. 1—Referring to the illustration the end of the piston rod is made as large on the crosshead end as is possible, allowing for the rod to slide through the back cylinder head. Threads are cut on the rod to receive the clevis which is tightened and held in position by a lock nut. The crosshead is connected to the piston rod by a knuckle joint and pin. The end of the crosshead is machined to fit in the clevis.

Method No. 2—The crosshead end of the piston rod is made as shown by the dotted lines in the illustration. The end of the crosshead fit is made in the shape of a half cylinder which is machined for a cap that is bolted on with four 1-in. heat treated bolts, after which the

crosshead is bored and grooved to receive the piston rod. The rod is entered in the crosshead and the cap tightened. The bolts have lock washers, double nuts and cotter keys.

Method No. 3—The crosshead is threaded to receive the piston rod. It is split through the top as shown. The crosshead end of the piston rod has four keyways milled in it. A piece of flat steel is inserted in one of the grooves before the bolts are tightened. This serves as a lock to prevent the piston rod from backing out of the crosshead. Heat treated bolts are used to draw the crosshead together.

Method No. 4—The crosshead is bored or reamed with the usual standard taper. The rod is turned to fit, and is then driven into the crosshead. Two tapered holes are drilled and reamed, as shown, half in the crosshead and half in the piston rod. Heat treated taper threaded pins are then fitted and drawn in with the threaded end. The opposite ends of the pins are threaded so that they can be drawn out with nuts. No driving or sledging is necessary on this type of crosshead.

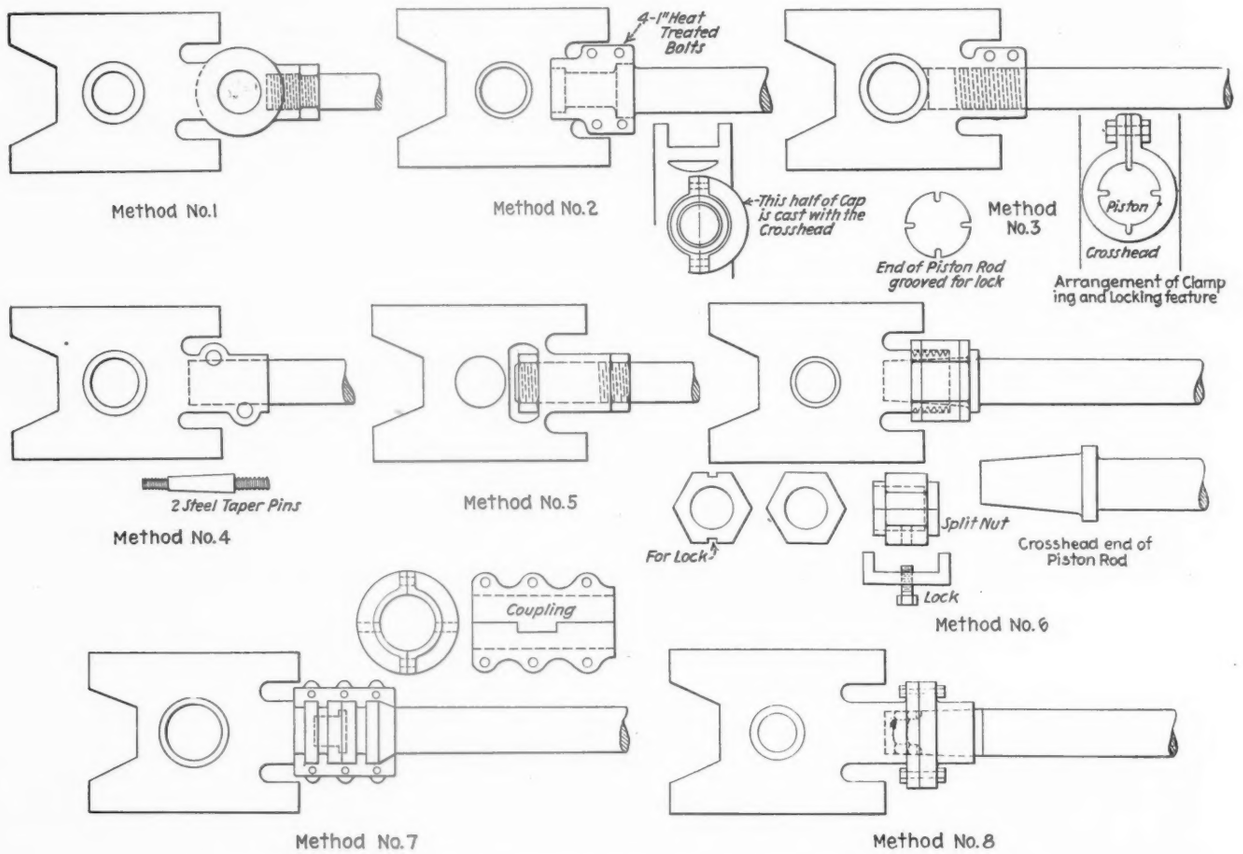
Method No. 5—The crosshead is bored and reamed with a slight taper and the rod threaded, as shown, to receive two nuts, which are drawn up tight. When removing the rod from the crosshead, the rear nut can be used for drawing the crosshead off the rod.

Method No. 6—The crosshead is bored out and reamed in the usual manner and the rod turned and fitted to the crosshead. The end of the crosshead has a thread cut on it. A large split nut is made with the sections held together by a steel retaining ring which in turn is held in position by the lock as shown. The rod is drawn into the crosshead by tightening the nut. A lock nut is used to prevent the large nut from backing off the crosshead.

Method No. 7—The end of the crosshead and the piston rod are machined as shown in the drawing. The piston rod is secured to the crosshead by the coupling with six ¾-in. heat treated bolts. The couplings are machined to lock so that the thrust will not be all on the bolts. The drawing shows how the halves of the couplings are machined for fitting.

Method No. 8—This shows a flange coupling. The piston rod is turned with the usual taper and threaded. The coupling is applied and held by two nuts and a washer. The crosshead, which is solid on the end, is bored out to receive the two nuts. The flange on the crosshead is cast with the crosshead. Four 1-in. heat treated bolts are used to hold the flanges together.

With the present design of crossheads, pistons and guides it is not frequently necessary to remove the crossheads for relining, or the pistons to renew cylinder packing, therefore, it is not necessary to give so much consideration to disconnecting the crossheads from the piston rods but rather to methods of connecting the two together to eliminate engine failures.



Sketches of eight methods of connecting piston rods to crossheads without using keys

DRILL CHUCKS.—A new catalogue, known as the 25th Anniversary Edition, issued by the Jacobs Manufacturing Company, Hartford, Conn., lists a new standardized line of chucks, to be known as the three-model line of Jacobs chucks. This standardized line consists of seven ball-bearing super models for use on drill presses, lathes and other production machinery; eight plain bearing improved models for portable tool and light drilling use, and four new self-tightening models—Jacobs Keyless Portomatic chucks—designed especially for use on portable tools where the hand-operated feature is desirable.

Mechanical drawing and apprentice training

By Warren Ichler

THE place of the draftsman in industry is too well established to require comment or defense. The question raised here is, whether or not the training in drafting that many apprentices receive, is suited in its entirety to the needs of the average apprentice, who is not interested in mechanical drawing as an end in itself in his training.

It would seem that any consideration of the place and weight to be assigned to mechanical drawing in the training of apprentices will have to begin with the promise that mechanical drawing, the representation of objects by outline only without attempt at perspective, cannot be considered as an adjunct or by-product of any trade, but must always be considered as a trade within itself, affecting all mechanical operations. Probably all too often even draftsmen lose sight of that fact and look upon their work as an indispensable part of some one trade or some group of trades without getting the broader viewpoint of the possibilities of their craft.

Necessarily, most draftsmen are specialty men, but this does not prevent them from acquiring a better understanding of the drafting problems of those industries related to their own special line of effort. By this, is meant, of course, the relative ease with which a finished draftsman can re-adjust himself to new lines of work as compared with the average mechanic's difficulties in rebuilding his craft knowledge and practices to suit changing conditions. It implies no unique knowledge on the part of the draftsman; rather, it indicates merely a more thorough standardization of the basic requirements of drafting than is possible in other vocations.

A concrete example of the foregoing thought is found in the fact that technically trained men emigrating to a foreign country seem, usually, to look to mechanical drawing as a "beginning job" or "stepping stone" to broader fields of usefulness while they adjust themselves to the language and customs of their new surroundings.

Relation of mechanical drawing to a trade

As a trade, complete in itself, it is obvious that drafting cannot be fully taught in connection with—say blacksmithing or woodworking, or in fact any other trade, when another trade is the objective of the student.

Is it really desirable to do more than to impart a knowledge of how to read drawings quickly and accurately, an understanding of the tools and methods by which drawings are produced and duplicated and an understanding of the geometrical construction problems incident to the draftsman's work? Even so much instruction is rather a large order for any vocational teacher in view of the limited time at his disposal and the writer feels that not much more than the fundamentals outlined above should be attempted in the average training class for apprentices.

There will always be present in any student group those whose mentality, preparatory work and tendencies will render these training requirements too simple and too easy of accomplishment. To such students, harder work can easily be assigned without any disruption of the regular schedule of the class and without undue distraction to the instructor and to less advanced students. Advanced students can always be set to copying more elaborate drawings than those required by the course or to free-hand sketching of mechanisms, or to the designing of simple mechanisms.

We all have to remind ourselves constantly that what we are trying to do for the apprentice is to give him a clear, logical trend of thought, a good conception of the tools with which he has to work, the habit of close observation and quick analysis—mental alertness, and those traits of character which one would naturally associate with the mental and physical equipment just outlined. Since all of these things are duplicated to a certain extent in the apprentice's trade education other than his studies of mechanical drawing it is hardly necessary to do more than to point out the duplications to defend what has been said in favor of limiting the drawing courses.

Why drawing courses should be limited

Beginning with the physical equipment and requirements of a finished craftsman, it must be noted that while mechanical drawing makes somewhat the same demands of deftness of hand and keenness of perception as do the craft standards of the average trade certainly such time as the average apprentice can spend in classroom work will not greatly enhance his natural physical equipment in these qualifications. Manual dexterity or analysis of a layout problem may not be so apparent in the shop as in the drafting room, but they are present in a high degree of perfection in every skilled mechanic.

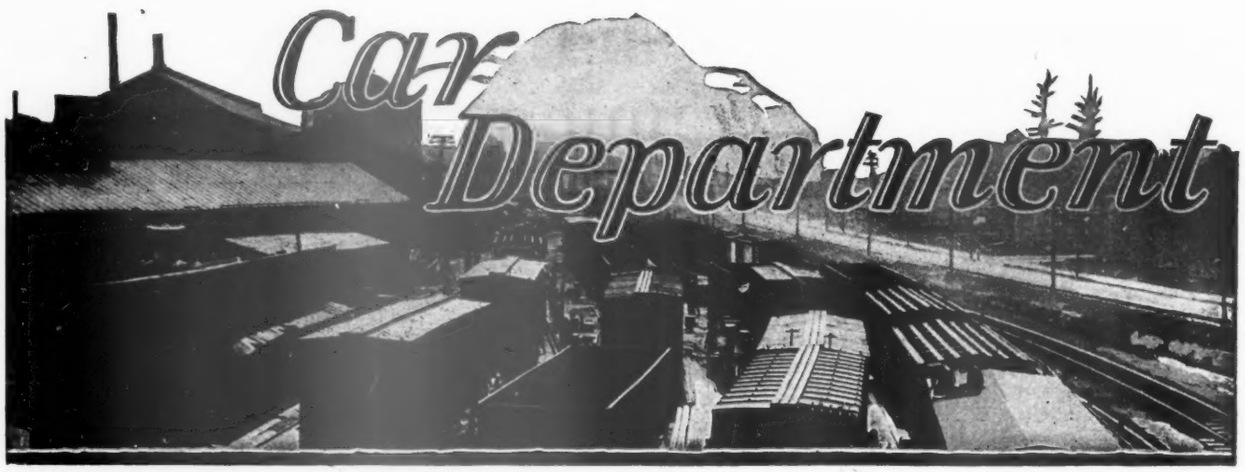
The writer feels as much of a sense of satisfaction, for example, in the handling and "feel" of a pair of calipers as in the mastery of the compass and ruling pen of the draftsman and it is a fair assumption that this feeling is shared by all mechanics who have any sense of pride in their trade.

Simple mathematical operations as may be necessary to the average drafting problem assigned to apprentices can as well be taught in a more limited survey of the subject;—say a course in blue-print reading.

One has to consider the design problems of drafting-rooms to cite examples where mathematical training, beyond that received in the average apprentice period, is an essential, and for those who desire such training beyond and aside from the regular apprentice courses, tutoring, night-schools, correspondence and university extension courses are nearly always available.

One of the beneficial results sometimes claimed for an extended teaching of mechanical drawing to apprentices is clarity of expression. One has only to ask the average draftsman to describe one of his own drawings to find out how little of that sort of ability he has acquired. The average shop man can give a better word-picture of almost any mechanism than can the average draftsman.

It would seem to be of doubtful value to offer or to insist on more than the mere fundamentals of mechanical drawing in apprentice classes. This view will not be popular because these courses are comparatively easily taught and are usually popular with apprentices. They are "showy" and create a good impression upon executives charged with the casual supervision of this sort of schooling.



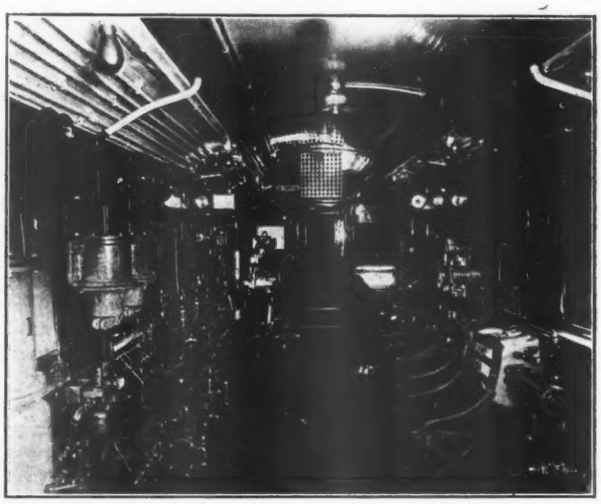
Illinois Central air brake car remodeled

THE air brake instruction car operated by the Illinois Central contained until recently a demonstration rack representing a 50-car freight train, together with sectional models of air brake equipment and the air brake instructor's living quarters in one end of the car.

With the increase in length of freight trains to 100 cars or more, it became evident that in order to reduce rough handling, slid flat wheels, and damage to equipment to a minimum, it was necessary to remodel the instruction car so that the instructor could demonstrate to engine and train crews the correct practice in handling long trains. Air brake instruction car No. 10 was accordingly taken into the Burnside (Chicago) shops of the Illinois Central, the living quarters removed and new equipment installed, the work of remodeling being carried out under the supervision of E. Von Bergen, general air brake engineer and F. H. Hinton, air brake instructor. The car was completed ready for service on August 30, 1927, office car No. 6 being assigned to accompany it in order to provide office and living accommodations for the air brake instructor.

Interior of remodeled Illinois Central air brake car containing 100-car demonstration rack

The air brake instruction car, 72 ft. long and weighing 162,160 lb., now contains a demonstration air brake rack with correct volumes, representing a 100-car train. There are 91 K-1 freight equipments, three F-36 freight equipments, five L N passenger equipments and one U-12-B universal equipment. The rack is so arranged that the six passenger equipments can be operated as either the six head cars or the six rear cars, or independently as a passenger train.



Each brake cylinder is wired to the electric indicating board in the front of the car

Interspersed through the train are three bad order freight triple valves, viz., leaky triple piston ring, defective emergency valve seat, sticky triple piston ring or "dynamiter." This enables the instructor to demonstrate to the employees the results of these defects in operation.

Each brake cylinder in the train is wired to an electric light on an indicator board. These 100 lights are numbered on the board, and as each brake applies, the light representing that brake becomes illuminated. When the brake releases, the light is extinguished. The indicator board is located above the instructor and thus the employees are enabled to face the instructor and the indicator board while observing the performance of the brakes during all demonstrations.

There are provided for demonstration purposes one complete E T locomotive equipment, H-6 brake valve,

S-6 Westinghouse independent brake valve, and C-6 Westinghouse feed valve; also one complete set of L T locomotive brake equipment with H-6 automatic brake valve, New York straight air brake valve, and New York F-2 feed valve; also one complete set of G-6 locomotive brake equipment. A brake pipe vent valve operates in connection with all locomotive brake equipments. Sectional models for use in explaining all internal parts of the equipment are provided as follows:

U-12-B universal valve.
L-3 triple valve.
K triple valve.
F-36 triple valve.
Plain triple valve.
L T control valve.
H-6 brake valve.
New York straight air brake valve.
F-2 feed valve and C-6 feed valve.
Brake pipe vent valve.
Double pressure retainer valve.
Freight car release valve.
Freight car combined auxiliary reservoir and brake cylinder.

Sectional models of steam heat equipment are also provided as follows:

Vapor regulator.
Steam heat reducing valves.
Vapor cut-out valves.
Thermostatic control.

A moving picture projecting machine, installed in a cabinet, is automatically focused when pulled out. Two hundred slides are provided, showing transparent views of all positions of air brake apparatus. The car is wired for 32 volts to operate lights and fans from the axle light generator when the car is in motion. It is also wired for 110 volts for use when the car is parked at terminals.

The air brake rack is painted gray, the walls being finished in mahogany with a white ceiling. Four ceiling paddle fans are installed. Comfortable chairs are provided in sufficient numbers so that a class of 52 men can be seated at one time.

The office car contains an observation end and office, two staterooms, a dining room, a porter's room and a kitchen. This car is also wired for both 32 volts and 110 volts, to provide power for lights and fans either when the car is in motion or while parked at a terminal.

Decisions of the Arbitration Committee

(The Arbitration Committee of the A.R.A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Responsibility for second cleaning of air brakes within six months on account of illegible stencil marks

On May 23, 1925, the New York, New Haven & Hartford cleaned the air brake equipment, as per Rule 60, on Maine Central car No. 35506 on account of an old date. On July 1, 1925, the Rutland Railroad cleaned the brake equipment on the same car, as per Rule 60, on account of an invisible date. The Maine Central took exception to the Rutland's bill covering the second cleaning of the air brakes within a nine months' period and requested the Rutland counterbilling authority for $5.50 covering cleaning, oiling, testing and repairs to brake equipment in connection with the cleaning, based on the belief that proper careful cleaning of the old stencil date was not carried out as prescribed in the note of Rule 60.

The decision of the Arbitration Committee was to the effect that, "The evidence seems conclusive that responsibility for the improper air brake stenciling rests with the New York, New Haven & Hartford. Settlement should be made with the owner accordingly.

"Air brake stenciling, if properly applied, should under normal conditions of service remain legible for a period of twelve months. In any event, with due regard to unusual conditions of service, it should remain legible for a period of at least six months. Therefore, the six-months' time limit will govern in the settlement of such controversies.

"Note—Attention is again directed to the importance of exercising special care in ascertaining previous marks, as well as the application of new marks, as outlined in the note to Rule 60."—*Case No. 1490—Maine Central vs. Rutland Railroad and New York, New Haven & Hartford.*

Basis for computing depreciation on a destroyed car

Wheeling & Lake Erie car No. 22300 was destroyed on the Delaware & Hudson on June 5, 1924. Upon request from the D. & H., the owner furnished a depreciated value statement showing the car to have been built new in March, 1918. The owner took exception to the date built, claiming that this was not the original date the car was built. The W. & L. E. contended that during 1917, it adopted a program calling for the actual dismantling and retirement of 1,000 80,000-lb. capacity, gondola cars. The program included the complete overhauling and rebuilding of the trucks, the reclaiming of the air brake material, queen posts, brake levers, dead lever guides and truss rods, and the building of 500 flat cars, 400 box cars and 100 stock cars on the trucks removed from the 1,000 dismantled gondola cars using the above reclaimed material in the construction of the new bodies. The box cars built were equipped with new roofs, ends and door fixtures, and were modernized throughout. Therefore, the owner contended, the car was not one that had merely received heavy repairs and then was claimed as a rebuilt car, but was a new car. The Delaware & Hudson contended that the circumstances surrounding the rebuilding of the car in question was covered by Rule 12, Section (a), second paragraph and that the depreciation should be figured from the original date the gondola car was built (August, 1905).

The Arbitration Committee stated that, "An investigation by a representative of the Arbitration Committee failed to substantiate the statement of the Wheeling & Lake Erie that the body of this car was built new (in March, 1918) within the requirements of Rule 112 and Interpretation No. 3 thereto. The claim of the Delaware & Hudson is sustained. The car owner should correct the valuation statement on the basis of depreciation on car No. 44843 from the date originally built."—*Case No. 1491—Wheeling & Lake Erie vs. Delaware & Hudson Company.*

Rule 32 again

On October 1, 1923, considerable repairs were made by the Chicago, Milwaukee & St. Paul on LUBX tank car No. 1140. The owner maintained that the car was derailed and refused to honor the bill for repairs. The repairing line, after a diligent search of all available records, could not find any evidence that the car had been derailed, cornered or side-swiped.

The decision rendered was to the effect that there

was no conclusive evidence to substantiate the contention that the repairs in question were due to derailment or other unfair handling under Rule 32. Therefore, the position of the Lubrite Refining Company was not sustained.—*Case No. 1492—Chicago, Milwaukee & St. Paul vs. Lubrite Refining Company.*

Cars destroyed by fire on private siding

On December 31, 1923, the Cleveland, Cincinnati, Chicago & St. Louis delivered to the Peoria & Pekin Union, two Michigan Central cars. On January 7, 1924, the Michigan Central was advised by the Peoria & Pekin Union that the two cars had been badly damaged by fire and requested a depreciated value, as per A.R.A. Rule 112. Subsequent correspondence brought out the fact that these cars at the time of destruction had been located on the private tracks of the Corn Products Refining Company, being placed there by the Peoria Railway Terminal Company, with which the Peoria & Pekin Union has an agreement covering the switching service of loaded or empty cars to and from the plant of the private company. The Michigan Central contended that the Peoria & Pekin Union were responsible for the destroyed cars as it reported the cars destroyed while in its possession, requested their depreciated value, authorized bill and also paid the per diem for the three days subsequent to delivery before being destroyed.

The decision of the Arbitration Committee was to the effect that "The delivery of the cars upon the track of the Corn Products Refining Company having been made by the Peoria Railway Terminal Company, that company is responsible under Rule 113 insofar as settlement with the owner is concerned."—*Case No. 1493—Peoria Railway Terminal Company vs. Michigan Central.*

Responsibility for paint damaged by chemical spilled over car

On June 22, 1925, LUBX cars No. 1083 and 1008 loaded with fuel oil were billed to the Aluminum Ore Company by the Lubrite Refining Company, via the Alton & Southern. The paint on these cars upon arrival home to the owners was found to have been partially removed. The owner claimed that the paint was removed by some chemical having been spilled over the cars and requested defect cards from the Alton & Southern. The handling line declined to issue defect cards on the ground that there was no rule requiring them to do so. The rules make fire damage delivering line defects, but do not cover cars burnt by acid or chemicals.

The Arbitration Committee stated that, "the evidence was not conclusive as to responsibility of the Alton & Southern for this damage. Therefore, the claim of the Lubrite Refining Company is not sustained."—*Case No. 1494—Lubrite Refining Company vs. Alton & Southern.*

The handling line protected by Rule 32, but must pay for wrong repairs

On June 27, 1924, a billing repair card was made against the Penn American Refining Company for repairs to PAX car No. 215 by the N. Y., N. H. & H., amounting to $74.74. After the owner had inspected the repaired car it declined to pay the bill and took exception on account of evidence on the car indicating a derailment, off center and wrong repairs for which it furnished a joint evidence card. The owner claimed that the car had been derailed as shown by the markings on the wheel flanges and arch bars and showed off center by marks of flange wheels on the body bolster. The arch bars, lever guide and sand plank were also bent. The New Haven declined to cancel the charge, claiming that the car was damaged in regular switching service with rider protection, and therefore, the owner was responsible. The New Haven contended further that if the car showed evidence of a derailment, a defect card should have been requested at interchange from the road delivering the car home. It also declined to furnish a defect card, claiming that there had been no wrong repairs made.

The decision was to the effect that, "the car was not subjected to unfair usage within the scope of Rule 32. The New Haven, however, is responsible for the improper repairs on the center sills as per joint evidence." *Case No. 1496—Penn American Refining Company vs. New York, New Haven & Hartford.*

Wheels mounted on A. R. A. standard axles with wheel seats in excess of standard diameter

On February 19, 1923, the Southern Pacific changed the wheels on C. B. & Q. car No. 131803 on account of one wheel with a vertical flange and at the same time applied new wheels mounted on an 80,000-lb. capacity axle with a 6¼-in. wheel seat. A bill was rendered for new wheels, less one scrap and one second-hand wheel. In June, 1923, the owner made a claim that the wheels were scrap on account of being mounted on seats ¼ in. over the maximum dimensions and that the charge of $18.66 should be cancelled and $3.48 allowed for the good second-hand wheels removed. The Southern Pacific allowed $15.18. The C. B. & Q. claimed $6.96 still due. On February 17, 1923, the Southern Pacific applied four pairs of wheels to C. B. & Q. car No. 116939 on account of being slid flat, and mounted wheels on 80,000-lb. axles with wheel seats of 6¾ in., 6¾ in., 6 13/16 in. and 6¾ in. On June 22, 1923, the C. B. & Q. claimed that the wheels were scrap as they were mounted on oversized wheel seats and the owner was, therefore, due an allowance of $27.84, as it was entitled to good second-hand wheels under the car in place of scrap wheels. The Southern Pacific refused the claim on the ground that it charged nothing for the wheels. Again on April 19, 1925, the Southern Pacific applied new wheels to C. B. & Q. car No. 100499, on account of the wheels being slid flat and applied two wheels on an 80,000-lb. capacity axle with the wheel seat measuring 6 11/16 in. On June 12, 1925, the C. B. & Q. claimed $20.90 based on $14.60 wheel betterment charge plus the difference between the second-hand and scrap wheels or $6.30, as scrap wheels had been applied instead of a serviceable pair of second-hand wheels to which the owner was entitled. The Southern Pacific allowed a betterment charge of $14.60, but declined to allow for scrap wheels applied, the case being similar to car No. 116939.

The Arbitration Committee stated that, "the contentions of the C. B. & Q. were sustained."—*Case No. 1497—Southern Pacific Company vs. Chicago, Burlington & Quincy.*

Another case of Rule 32

On June 15, 1925, the Baltimore & Ohio reported the destruction of Chicago & Alton stock car No. 28773 and requested a depreciated value statement to cover the car. On June 25, 1925, the B. & O. again addressed the C. & A. requesting that its letter of June 15 be disregarded as a subsequent investigation developed that the car had been damaged under conditions making the owner responsible and disposition was requested for the

car in accordance with the provisions under A.R.A. Rule 120; the B. & O. furnishing the C. & A. with an inspection certificate showing the conditions of the car, also a statement setting forth the actual circumstances in connection with the damage. The C. & A. declined to furnish disposition for the car under A.R.A. Rule 120, claiming that the car had been mishandled and was subject to the provision of A.R.A. Rule 32, Paragraph (d), Section 2, which reads as follows: "Wrong or misinterpreted signals or failure to give or to observe signals." The B. & O. stated that the car had not been derailed, cornered or side-swiped and that the car failed in regular switching service and, therefore, its condition is the owner's responsibility in accordance with Rule 32. The inspection made by the C. & A. revealed among other things that six body truss rods had been cut in two with an acetylene torch to facilitate handling the damaged car and that the triple valve had been removed and could not be located when the car was inspected. Furthermore, the 8 in. cylinder and reservoir were both shown as broken, whereas, the cylinder only had one suspension bolt lug broken off.

The Arbitration Committee stated that, "the car was not damaged within the scope of Rule 32. The owner is responsible. In the event, however, that the car owner authorizes repairs to the car, if the truss rods were cut by an acetylene torch and the triple valve was missing as alleged, the B. & O. is responsible for these items."—*Case No.* 1498—*Chicago & Alton vs. Baltimore & Ohio.*

Handling material at the Sayre car shops

ADEQUATE handling of material has always been an important problem in the management of any car shop, not only that phase of the problem pertaining to transporting materials used in actual car construction, but also in providing efficient facilities for workmen required to move their tools and working equipment from car to car. In this respect, the wood car shops of the Lehigh Valley, Sayre, Pa., is no exception and many readers will be interested in how the problem of handling material has been solved at that point.

Referring to the illustration, Fig. 1, shows a small shop made truck for handling mounted car wheels. Another view of the truck with the journal carrier pulled up out of the hole in which it pivots is shown in Fig. 3. The wheels are 12 in. in diameter, 3 in. wide at the rim and are made of cast iron. They are spaced 12 in. apart, center to center of the rim. Two of these trucks are used in handling a pair of wheels. When it is desired to move a pair of wheels a short distance, two repairmen each take one of these trucks and back it under the journal, as shown in Fig. 1, with the handle raised so as to tilt the body of the truck backward. The journal rests on the journal carrier which is made of 1¼-in. round bar, to the top of which is welded a flat piece 6 in. by

Fig. 1—Two-wheel truck for transporting wheels. Fig. 2—Truck for handling doors and steel ends. Fig. 3—Close-up view of the trucks shown in Fig. 1. Fig. 4—Trailer trucks for handling miscellaneous material, car doors and steel ends. Fig. 5—Wheel barrow for air brake repair men. Fig. 6—Portable tool box for metal workers. Fig. 7—Portable material and tool box for wood car repairmen

2 in. by ½ in. shaped to fit the contour of the journal. The bar of the journal carrier also serves as a center pin for the wheel truck so that the wheels may be turned. The wheels are raised from the ground by lowering the handles, which are 65 in. long.

Fig. 2 shows a cart for transporting car doors and steel ends. It consists of two cast iron wheels about 24 in. in diameter turning on an axle, forged as shown in the illustration. The door or steel end is placed on its edge in the pocket formed by the axle. Pieces of flat iron or steel are welded to the axle as shown, to provide a support for the door.

In Fig. 4 are shown two two-wheel carts built to be hauled by electric or gasoline truck. The cart shown at the left is used for miscellaneous material and the one shown at the right for doors and steel ends. Doors or ends can be placed on the brackets on either side of the cart.

Fig. 5 is a wheel barrow for the use of air brake repair men. The two boxes are for tools and the floor is used for triple valves, etc. Fig. 6 shows a portable tool box for the use of the metal worker. It is provided with a tray for holding small tools and materials. The lid can be padlocked. Fig. 7 is a tool and material cart for the use of car repairmen engaged principally in rough carpenter work. This cart is provided with a leg and can be used as a bench. The body of the cart is built higher than the wheels so that material extending out over the wheels may be readily moved.

A convenient shed for storing box car doors

THE shed shown in the illustration was recently erected at the car repair shops of an eastern railroad for the purpose of storing box car doors while awaiting application to the cars. It can also be used for doors other than box car, such as poultry cars and stock cars. The doors are assembled at the wood mill and the parts covered by metal are brush painted as shown in the lower view. The door is taken to the shed on the two-wheel cart.

Top—Doors are hung outside where they are spray painted before being pushed to the rear—Bottom—Delivering a door to the shed for painting and storage

The shed is provided with door rails on which the car doors are hung. These rails extend beyond the end walls over the covered platform. Each door is hung, on arrival at the shed, over the outside platform where it is spray painted. After the painting has been completed, it is pushed back to dry. The shed is located alongside the outgoing track from the repair shop and the doors are applied as each car passes the shed. It has storage capacity for 22 doors.

A hand brake chain reel for the car yard

THE hand brake chain reel shown in the illustration was built by the blacksmith standing at the left of the reel. It was built largely of scrap material, the legs being made of old brake pipe and the braces from ¾-in. pipe through which rods, headed at one end and threaded for nuts at the other, are placed to secure the legs and braces. The end wheels of the reel are hand forged.

A useful reel for hand brake chain

CHAIN HOISTS.—The four-page bulletin, No. 21, of the Dickerman Hoist Mfg. Company, Cleveland, Ohio, describes and illustrates the construction and operation of the Ideal spur-geared, ball bearing chain hoist.

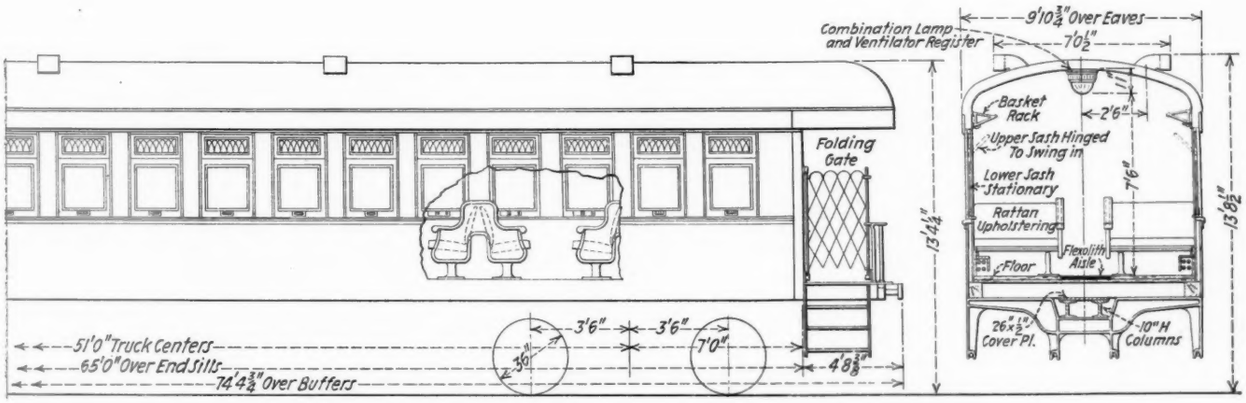
Reconstructed suburban car recently placed in service by the Delaware & Hudson between Wilkes-Barre, Pa., and Carbondale

Passenger car reconstruction on the D. & H.

Modified turtle-back roof adopted as standard— Interior arrangements of unique design

THE Delaware & Hudson has incorporated a number of new and unusual features of construction in the design of two types of passenger cars which it has recently reconstructed and placed in service. The two most prominent features are the modified turtle back roof, which has been adopted as standard for all passenger cars on the system, and the unusual interior arrangements planned to meet the needs of travellers over the Delaware & Hudson. The selection of the modified turtle back roof has also permitted the introduction of a number of innovations not only in the design of the car body itself, but also in the general scheme of ventilation.

The two types of reconstructed cars described in this article are typical of the general design the railroad has adopted for all of its passenger equipment. A cross section of the body design is shown in one of the drawings, which also shows the standard scheme of roof ventilation. The lighting fixtures are combination ventilators and lamps, spaced equidistantly along the center of the ceiling. They are connected with air ducts laid between the roof and the ceiling which lead to exhaust ventilators located on the roof of the car. This ventilation system was developed by the car department of the Delaware & Hudson. A copper drip pan is located directly beneath the exhaust ventilator to take care of any moisture that may collect. This prevents any moisture running down between the roof and ceiling and collecting in the side of the car.



Elevation and cross-section of the D. & H. suburban cars

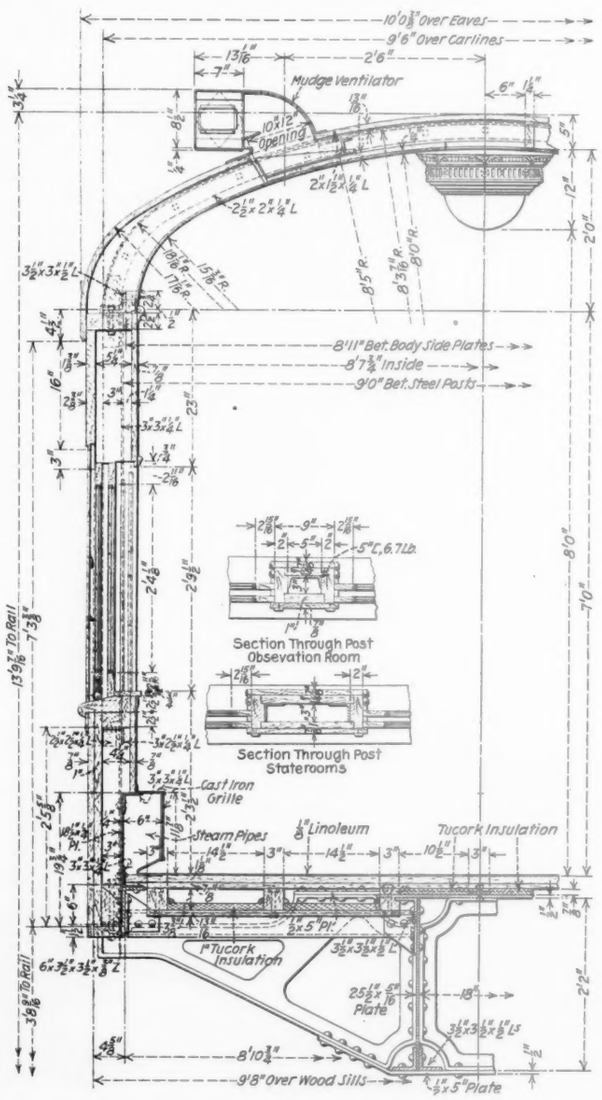
Body and underframe construction

Another feature shown in this drawing is the side sill construction. The principle side sill member is a 6-in. by 3½-in. by 3½-in. by ⅜-in. Z-bar riveted to a Commonwealth cast steel combined platform and double body bolster. A 3-in. by 3-in. by ¼-in. angle is riveted to the top of the Z-bar, as shown. The ends of the floor boards are fitted against the inside of the vertical leg of

this angle. The side sill itself is then completed by a ¼-in. plate, 18¾ in. wide, riveted direct to the Z-bar and bottom angle. A second 3-in. by 3-in. by ¼-in. angle is riveted to the top of the plate, which gives a total height of 19¾ in. for the side sill construction.

The top member of the steam pipe enclosure is secured directly to the horizontal leg of the top angle, which makes the steam pipe enclosure and side sill practically a single unit. This type of side sill construction is comparatively easy to apply to the car and it also provides easy access to the steam pipes in case repairs are necessary. This feature is also illustrated in the drawing of the bolster and side sill construction.

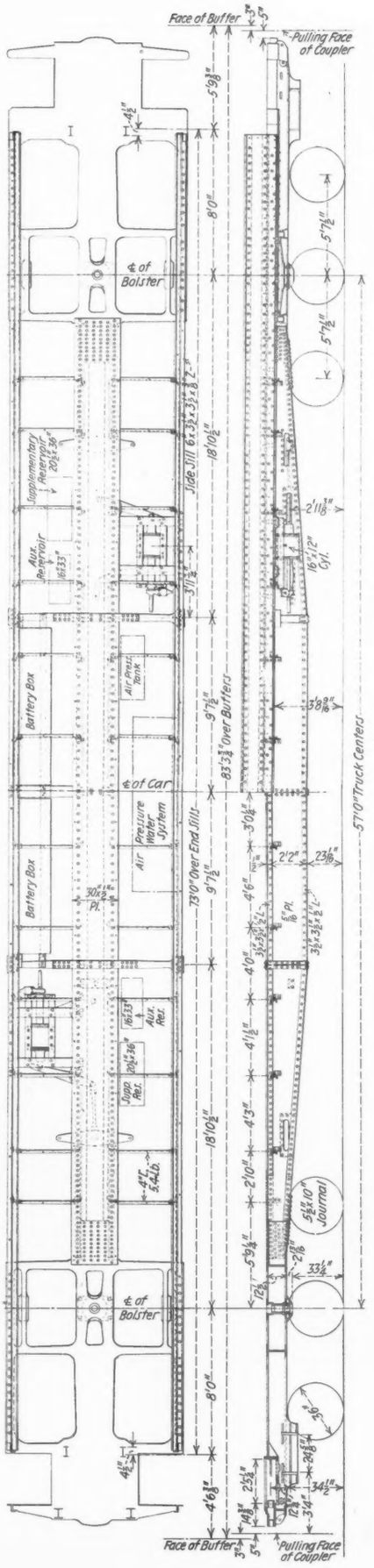
The adoption of the modified turtle back roof has



Cross section of the body construction

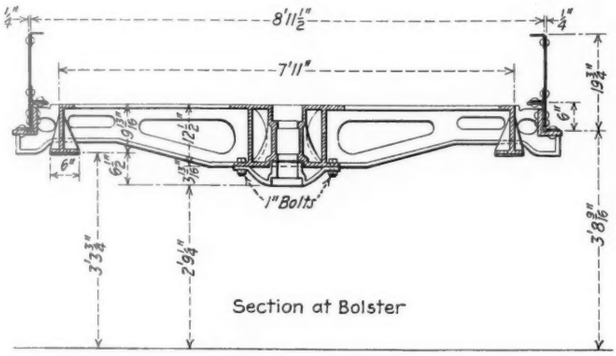
required practically no change in the vestibule design. The body frame construction allows continuous carlines from the side to the ridge pole, which is a 2-in. by 1½-in. by ¼-in. angle extending the length of the car. It is believed that this type of construction provides a stronger body structure and also lowers the center of gravity of the car. The latter advantage, however, is partially due to the underframe construction.

It will be noted in the drawing of the underframe construction that the center sill is of fish-belly design.



Underframe construction of the D. & H. passenger cars

Six-wheel trucks are used, the truck bolsters being of cast steel design. The two cross bearers are of built up steel construction, full advantage being taken of the depth of the center sill in their design. The side sills



The bolster and side sill construction

and center sill are riveted direct to the combined platform and double body bolster.

The parlor-cafe cars

The floor plan of the parlor-cafe car is shown in one of the drawings. This car, which was originally of the clere-story deck type, has a length over the end sills of 70 ft., and is divided into three compartments, namely, a smoking compartment, non-smoking compartment and dining room. It has six-wheel trucks, equipped with clasp brakes and weighs 153,600 lb.

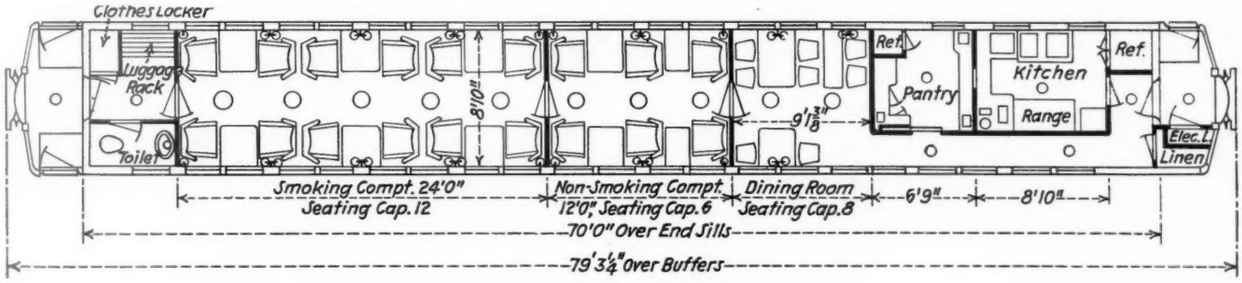
The smoking compartment is the largest of the three compartments, occupying 24 ft. of the length and having seats for 12 persons. The non-smoking compartment is located in the center of the car and has seats for six persons. The dining room is located next to the non-smoking compartment. The pantry and kitchen are considerably larger than are ordinarily used in parlor-cafe car service, sufficient cooking facilities being provided to serve meals to coach passengers in the dining room, which has a seating capacity for eight persons, as well as to the parlor car patrons. Both parlor compartments are furnished with movable chairs, and tables are provided for the serving of meals.

The interior finish

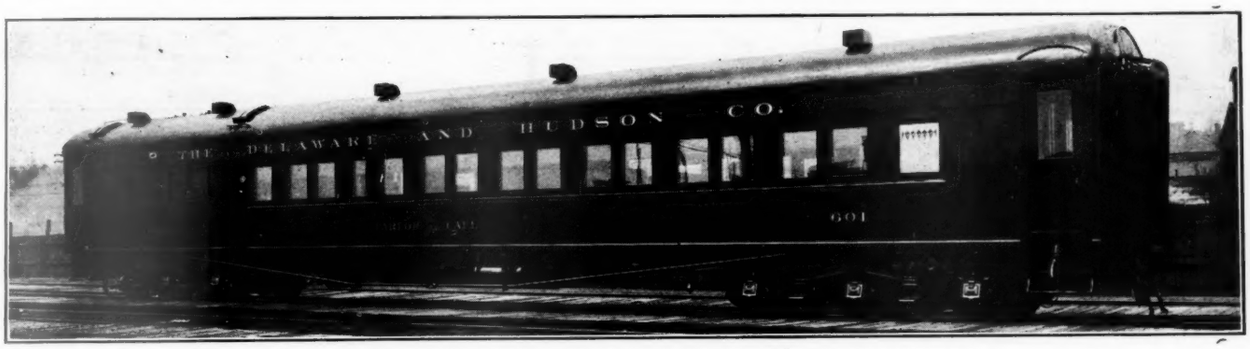
The vestibule at the smoking compartment end of the car is provided with steps on both sides for the entrance and exit of passengers at station stops. A large luggage rack for the convenience of the passengers is located immediately inside the door. The vestibule at the kitchen end of the car is provided with only one pair of steps, the step space on the opposite side being occupied by a linen locker and a switch locker for the car lighting equipment.

The interior of the car is finished in black walnut with white enamel bulkheads and headlining. The electric lighting fixtures and hardware are of satin silver finish, in harmony with the interior color scheme. The car is equipped with 11 double and eight single wall lamps and six specially designed combination ventilator center lamps. Four fans with rotating deflectors, spaced in relation to the size of the compartments, are suspended from the ceiling. A Pullman style slide ventilator is placed at the bottom of each window sash. The atmosphere in the smoking compartment is kept clear by means of an exhaust blower.

The floor is covered throughout with carpet under which Ozite, a felt designed to deaden sounds, is laid. The furnishings of the two parlor compartments are identical, both compartments being provided with comfortable high backed chairs upholstered in frieze plush which may be moved at the occupant's pleasure. The smaller parlor compartment has accommodations for six persons and is intended for the use of passengers who do not wish to smoke. The dining compartment is provided with straight-backed chairs where coach passen-



Floor plan of the D. & H. parlor-cafe car



Parlor-cafe car remodeled by the Delaware & Hudson

gers in the train may be served meals in the customary fashion.

The kitchen and pantry are finished in French gray and are fully equipped with modern facilities. The work tables, etc., are covered with Monel metal. The lavatory is equipped with a flush hopper and a white enamel pedestal washstand.

The suburban cars

The suburban cars, four in number, which were recently placed in service between Wilkes-Barre, Pa., and Carbondale, were originally of all-wood construction. They were remodeled to handle the commuter traffic between these two points, which are 34 miles apart. The length over the end sills is 65 ft., and the length over the buffers is 74 ft. 4¾ in. Each car has seats for 82 persons. the average light weight being 105,000 lb. The overall height of these cars is 13 ft. 4¼ in. and the width over the eaves, 9 ft. 10¾ in.

Unusual window design

The interesting features in the reconstruction of these cars are the type of seats with which cars are equipped and the unusual design of the windows. The seats, supplied by the Heywood-Wakefield Company, are similar in design to those commonly used in sleeping car sections. They are of double construction, built as a unit, back to back and are upholstered in rattan. Space is provided between the backs for luggage. This arrangement keeps the luggage out of the aisle.

It will be observed from the drawings and illustrations that each window is provided with an upper and lower single sash. The upper sash has a pane of Gothic prism glass and is arranged to swing inward to admit fresh air. The lower sash, which cannot be raised, has a Pullman style slide ventilator in the bottom rail.

Interior design and system of ventilation

The extreme height inside is 7 ft. 6 in. and the inside width is 8 ft. 10 in. The interior of each car has a mahogany finish with white enameled bulkheads and headlining. Flexolith flooring is laid in the aisle the full length of the car.

Eleven combination ventilator center lamps are spaced equidistantly along the center of the ceiling. The air ducts, laid between the roof and ceiling, lead to Utility type exhaust ventilators located on the roof of the car. The heating system is the Vapor thermostat control arrangement. The electrical equipment and lamps were furnished by the Safety Car Heating & Lighting Company.

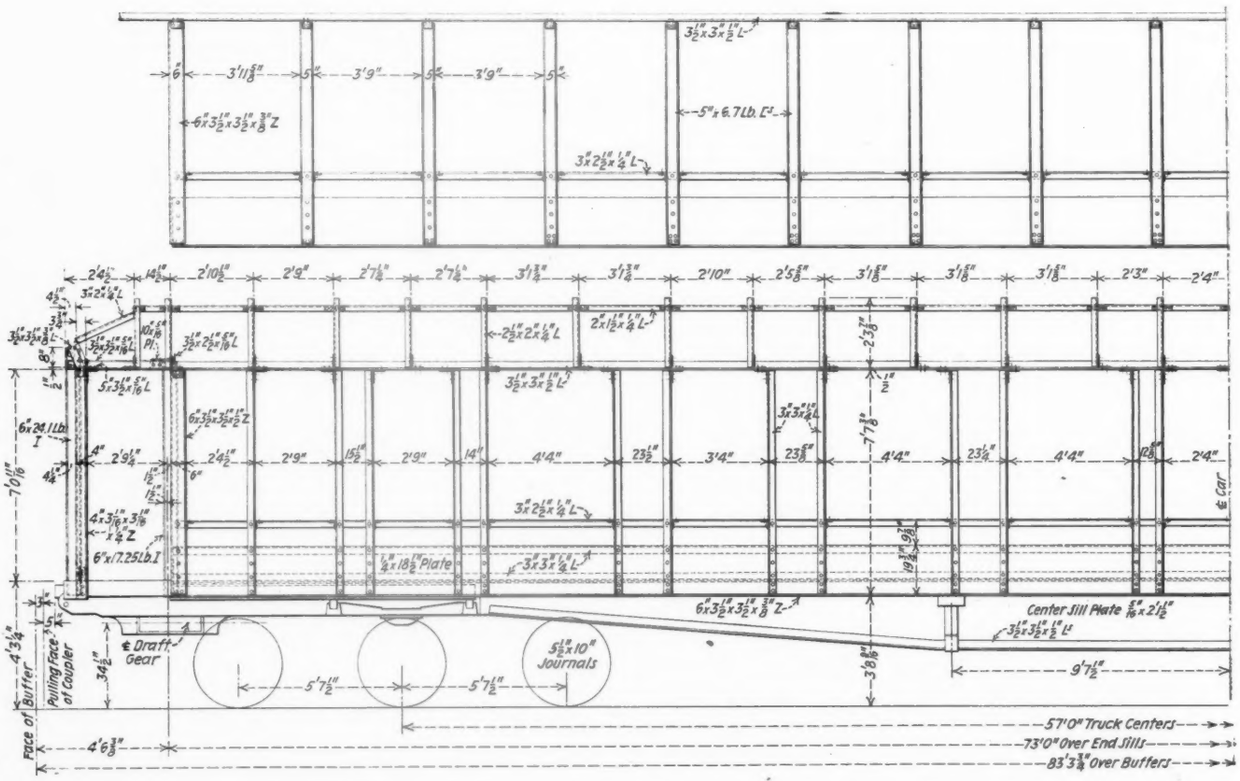
The cars have open platforms equipped with high folding safety gates. The steps are steel plates with Kass safety treads and the entire floor of the platform is covered with Kass safety matting.

Underframe and trucks

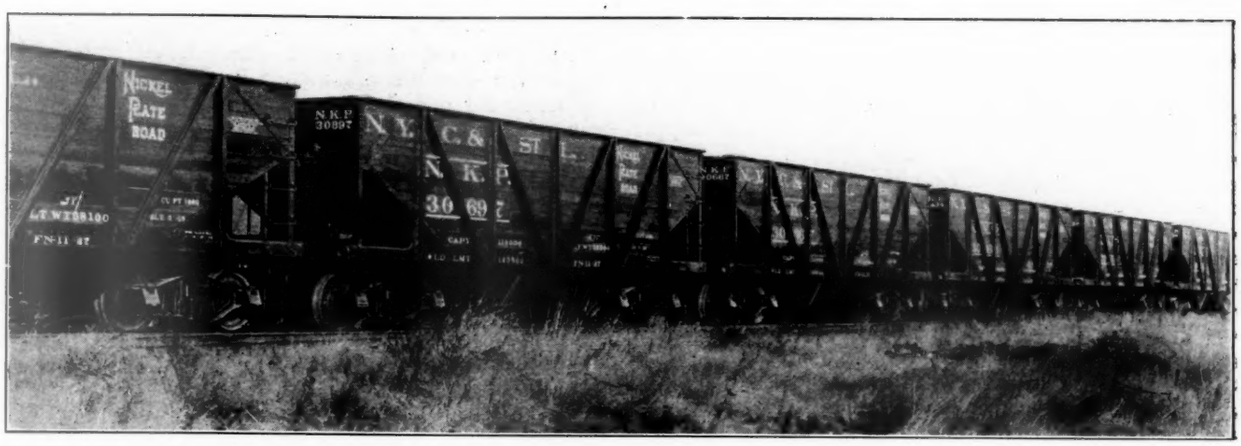
The trucks consist of Commonwealth cast steel frames, bolster and spring plank, 36-in. diameter steel wheels mounted on 5-in. by 9-in. journals, and Simplex type clasp brakes.

The underframe consists of two 10-in. H-beams reinforced with a top cover plate ½ in. by 26 in., Commonwealth combined platforms and double body bolsters, and Commonwealth steel needle beams.

The reconstruction work on both the parlor-cafe and the suburban cars was performed at the Oneonta, N. Y., car shops of the company.



Elevation and plan drawing of the D. & H. passenger cars



A string of completed cars ready for service

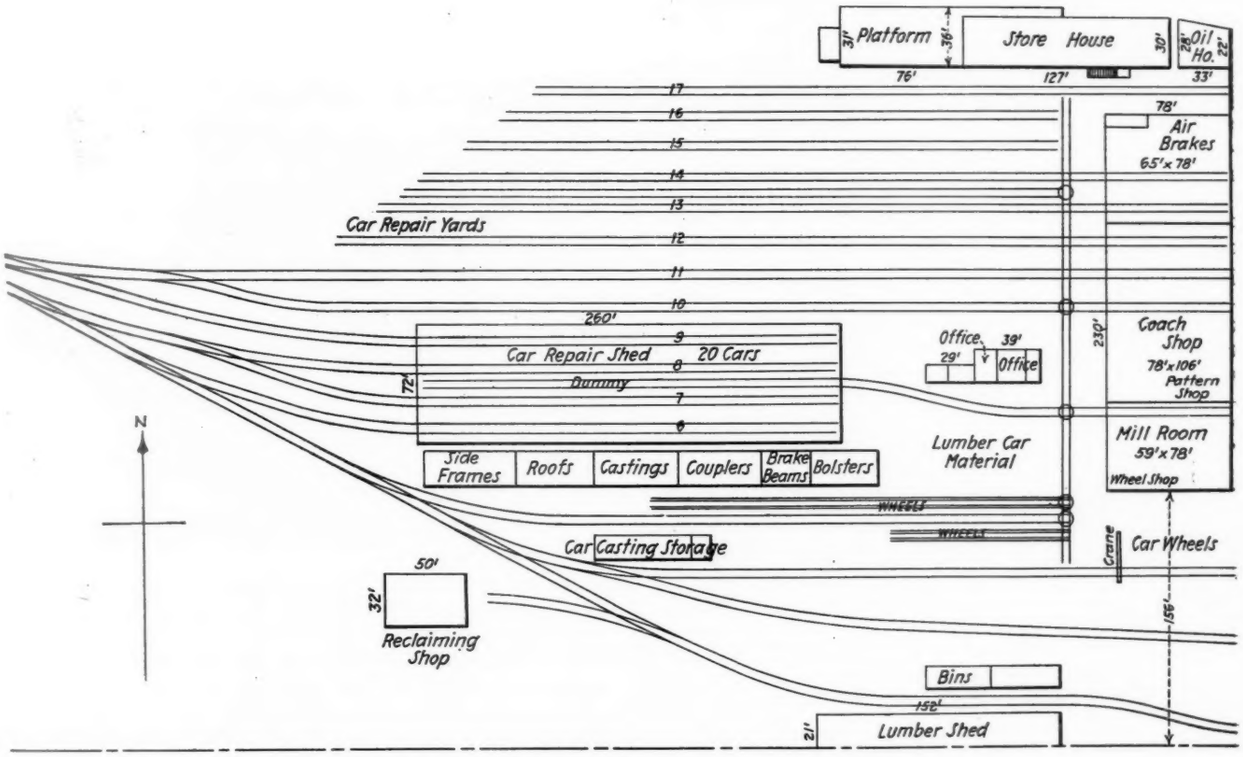
Progressive repairs to hopper cars

Nickel Plate operations at Frankfort, Ind.—Reclaimed material an important factor in rebuilding the cars

IN the last August *Railway Mechanical Engineer* there appeared an article dealing with repair work on automobile cars at the Conneaut, Ohio, shops of the New York, Chicago & St. Louis. As explained in that article this road has adopted a program of repairing freight cars at five of its car shops, by which each shop specializes on a certain class of cars, the assignment of cars being made to each shop as nearly as possible in relation to the locality which gives origin to the commodity for which the cars will be required when returned to service.

This article describes the operations in connection with the overhauling of a series of 750 composite hopper cars of 110,000 lb. capacity at the Frankfort, Ind., shops of the company. These cars, originally built in 1917 and 1918, are used principally for coal loading in southern Illinois and for gravel loading in western Indiana.

The cars are built with all-steel underframes and steel

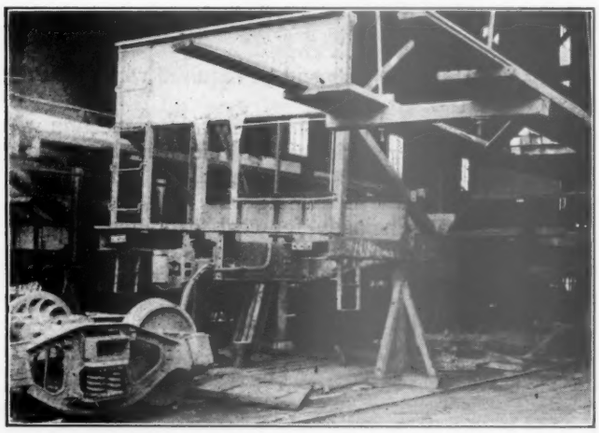


The layout of the shop, showing arrangement of tracks and buildings

posts and braces. The side planking and all flooring is of wood. The trucks have cast steel side frames with journal boxes cast integral. The journals are 5½ in. by 10 in. and the wheels 33 in. in diameter. The hopper doors are steel.

The freight car shop at Frankfort, a layout of which is shown in an accompanying drawing, is a semi-enclosed, dead-end shop having four working tracks and a material track under cover. The work on these hopper cars is concentrated on three of the shop tracks and is carried out on the progressive system, wherein six cars are spotted on each of the three shop tracks and specialized gangs move from car to car. The overhauling job is accomplished in eight major operations, five of which are performed while the cars are on the shop tracks, the remaining three—sand blasting, spray painting and stencilling—being completed after the cars are pulled out of the shop. The shop building is 260 ft. long and is provided with permanent suspended scaffolding.

In rebuilding these cars reclaimed material has been utilized to the fullest possible extent but an important feature is that no single car has both new and reclaimed material in it as far as the steel parts to be renewed are concerned. Renewals of steel parts consist of slope sheets, cross hoods, hopper sheets, hopper doors, floor support



After the first operation the stripping has been completed and the cars are ready for steel work and truck repairs

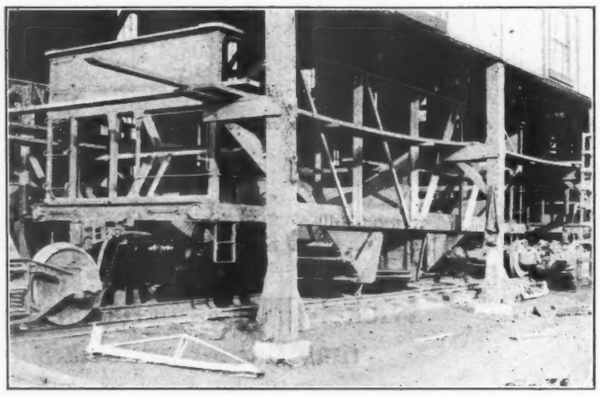
angles and minor parts. Posts, braces, steel ends, bulb angle side plates and underframes require a very small percentage of renewals. Of the total output of cars about 60 per cent contain principally reclaimed steel parts. No attempt is made to straighten bent shapes or sheets on the car but the car is stripped and all necessary straightening done in the reclaiming shop. The complete removal of steel parts requiring such attention makes somewhat more riveting necessary on reassembling but both the time and cost of reassembling is reduced as a result of the practice. The reclaiming shop is provided with special straightening equipment and furnaces which permit the economical handling of these parts. The wood parts that are removed from the cars are sorted and those which can be reclaimed are sent to the mill where the ends are cut off and the shorter lengths returned for subsequent use.

The new and reclaimed wood parts such as side planking and flooring are cut to template in the mill, spray painted with a priming coat and stored under cover until used.

Description of operations

When the cars are placed in the shop the foreman and an inspector make an initial inspection, marking such parts as are to be reclaimed or scrapped. All material for use in the several operations is distributed in quantities sufficient for one car only at a time and placed at the car in accordance with a schedule which assures its placement as required for each particular operation. Material is distributed by tractor and trailer—the material supply gang consisting of five men. Material for the entire operation is handled by one tractor and six trailers.

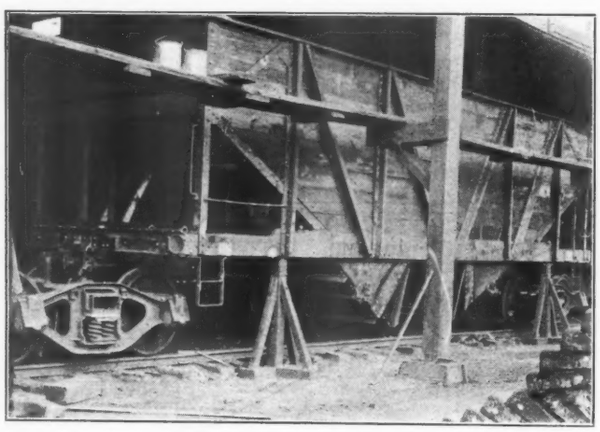
The foreman in charge of this repair job notifies the material supply men whether each car will be rebuilt with new or reclaimed material in order that the material



At this stage the steel work has been reassembled and riveted up

supply gang can distribute material in such a manner that new and reclaimed material will not be used on the same car. The supervision required on this job consists of a foreman, a piece work inspector, who assists on the final inspection of the cars, and a repair work inspector who with the foreman makes the initial inspection.

The cars are withdrawn from service as they are required for shopping. They are placed in the shop six at a time and, as the operations are planned, the gangs

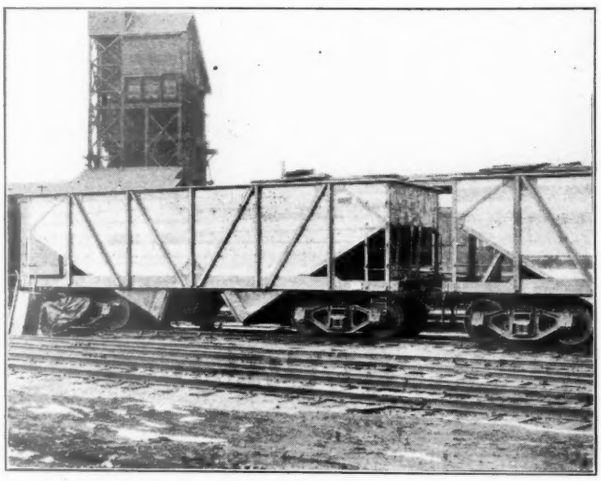


Side planking fitted and bolted up—Flooring not yet applied

move from car to car on one track until the last car on that track is finished. By this time all the gangs except those performing the last operations have passed on to the second track of six cars. They work along that track and when finished start on a new string of six cars on the third track which have been spotted in the meantime. From this track the gangs move back to first track which, by this time, has been pulled and reset. On the basis of a six-day week the completed cars are pulled out of the shop twice a week—six cars at a time. The

schedule of each operation is based on an output of two cars a day. The whole job may be divided into eight distinct operations as follows:

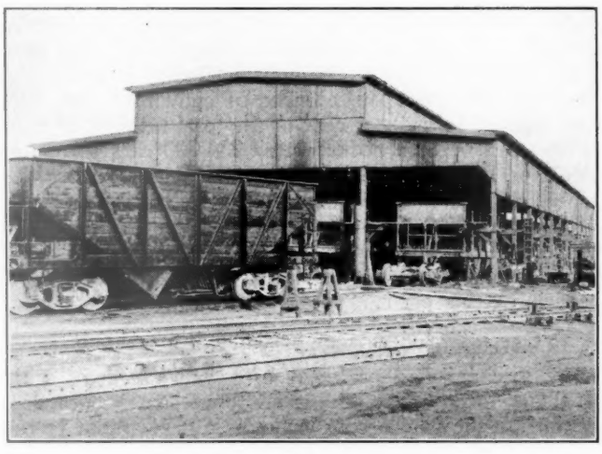
Operation No. 1—Truck repairs. This gang consists of two car men. Their first job is to jack up all six cars on one track and then drop back to the first car and start the truck work. This consists of removing the trucks from under the car, making necessary repairs to trucks, repairing foundation brake rigging, renewing



After the fourth operation the flooring is completed, trucks have been replaced and the car is ready for sandblasting

brasses and repacking journal boxes. This gang lowers all drawbars and repairs the draft gear and, after all other work on the cars has been finished, they lower the car onto the trucks, close the hopper doors and adjust the brakes.

Operation No. 2—Stripping. This gang consists of six men, two of whom are acetylene torch operators. These men remove all wood, bolts and rivets from the superstructure and such steel parts as require straight-



Here the first coat of black paint has been sprayed on—The final operations consist of the second coat and the stencilling

ening or renewal. All steel parts which are removed are loaded on trailers and sent to the reclaiming shop, the wood is sent to the mill for cutting down into shorter lengths, and the bolts, rivets, etc., which are scrapped, are cleaned up by a separate shop labor force.

Operation No. 3—Steel work. This gang consists of 11 men, 9 car men and 2 apprentices, including one acetylene torch operator. This operation consists of assembling, fitting and riveting all steel work, setting all parts in position, applying fitting-up bolts and reaming holes, riveting, heating the rivets and miscellaneous jobs incident to this operation. This gang also applies the hopper door rigging.

Operation No. 4—Side planking. This gang consists of four car men. On this operation all siding is applied, bored and bolted. This gang applies grab irons, hand holds, brake staffs and attachments and uncoupling levers.

Operation No. 5—Flooring. One gang consisting of four men who apply hopper flooring and do all boring and bolting in connection with application of the floor.

Operation No. 6—Sandblasting steel parts with portable equipment.

Operation No. 7—Spray painting. Car cement is used on the trucks and underframe. Black paint is used on the other parts.

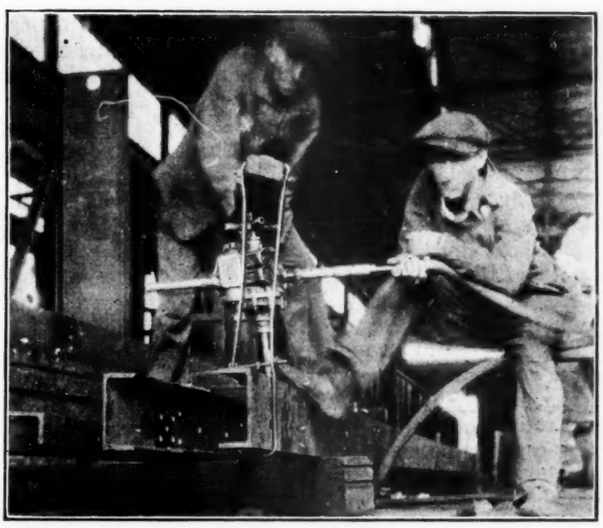
Operation No. 8—Stencilling.

Operations Nos. 6, 7 and 8 are performed by a gang consisting of one painter and two helpers who devote about 50 per cent of their time to other work than that required on these cars. All air brake work is handled by a shop gang of two men. This particular job takes up about 25 per cent of their time. All operations in connection with the overhauling of these cars are performed on a piecework basis.

Pressure lever for pneumatic drill

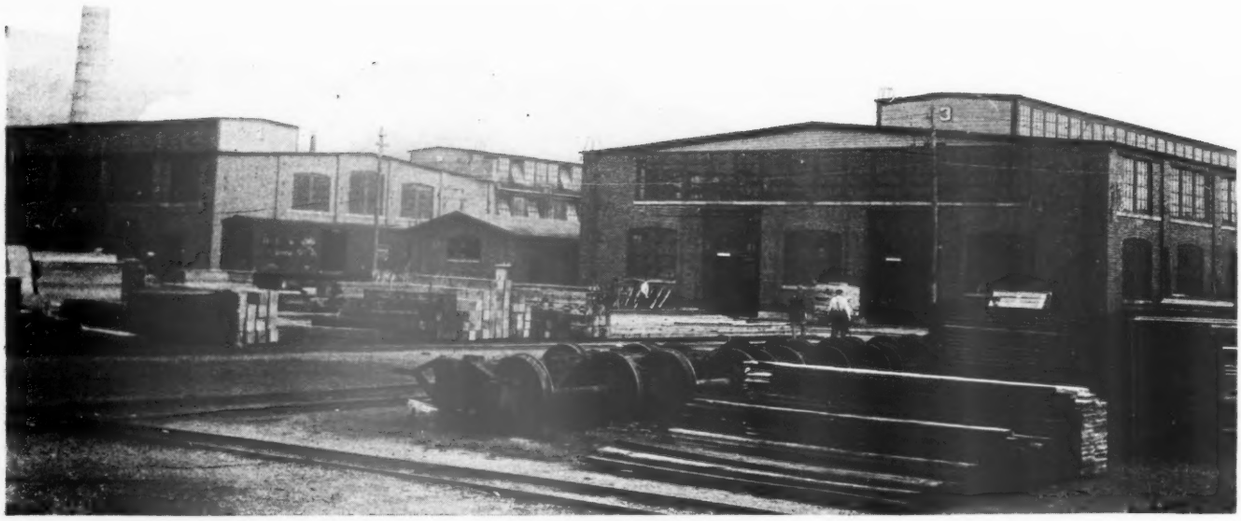
By Jos. C. Coyle

WHEN drilling channel irons which were impracticable to take to the regular drilling machine in the car shop, the handy pressure lever, illustrated, was found useful for applying sufficient pressure to the head of the air drill. It is made of 6-ft. length of strong



An effective pressure lever used when drilling long channels

wood, on one end of which is attached a steel plate on which to pivot the drill. At the head end of the lever, a 5-ft. section of 1½-in. by ¾-in. steel is bolted with one end bent to fit under the upper flange of the channel iron and the other under the lower flange. A similar lever, with hooks of equal length, is used in boring the flat side of the channel iron.



The general railway situation*

An address containing some highly pertinent comments of car department matters

By Samuel O. Dunn
Editor of the Railway Age

IT is probable that in the one hundred years history of the railroads of the United States there has never been as great an increase in operating efficiency as in recent years and especially since the shop employees' strike in 1922. The men in the mechanical department are familiar with what occurred in that strike and the results. Since the strike in 1922, which, together with previous developments, left the railroads in a demoralized condition and with a huge shortage of cars in the latter part of the year, there has been invested in the properties of the railroads about four billion dollars. I shall give you this and other large figures because they make us realize the magnitude of this industry, of the service it renders and of the problems with which its officers are constantly confronted. Of that investment since 1922 about one-half has been invested in improvements in permanent structures and one-half has been invested in new equipment.

There are about two-and-one-half million freight cars in the country. In five years there have been placed in service about 670,000 new cars, whi'e 624,000 cars have been retired, and there has been a large increase in carrying capacity because the new cars have been of greater capacity. It is very interesting to trace through the figures the changes that have occurred in the condition of freight cars. On August 15, 1921, there were in bad order 382,000 freight cars, or almost 17 per cent of the total number of cars on line. That condition had improved somewhat by July 1, 1922, when the shop men went on strike. It had been reduced to 14.3 per cent of the total number of cars. After that, for a while, the statistics become quite unreliable. In looking at the A. R. A. reports issued during the strike, in fact, covering the last six months of the year 1922, I found that they showed a decline in the number of bad order cars. Of course, we all know what the true conditions were. The results of the conditions which developed at that time are indicated by the enormous expenditures made in 1923 for car maintenance. In that year there were reached the highest figures that we have ever had, exceeding 596 million dollars. Any business that spends this much money in the maintenance of just one part of its equipment is an enormous business, indeed. On December 15, 1923, the number of bad order cars had been reduced to 6½ per cent of the total number of cars on line, this being a reduction of 234,000 cars since the middle of 1921. On September 1, 1927, the latest date for which figures are available, the railroads had only 141,000 cars in bad order, or 6.2 per cent of the total number. This was partly due to the new cars bought within recent years, but also partly to the policy of the roads in getting old cars into good condition.

Car maintenance of primary importance

The mechanical department of a railroad dea's with the shops, locomotives and cars. There has been a disposition on the part of the locomotive department to regard itself as of primary importance, but it is interesting to find that the investment in freight cars is about twice as large as the investment in locomotives. Also, in spite of the stress often placed on the importance of the locomotive department, the total expenditure for the maintenance of cars is greater than for the maintenance of locomotives. The maintenance of locomotives last year cost $519,500,000; of freight cars, $518,583,000; of passenger cars, $103,000,000.

The railroads have about 11,000 general foremen and assistant general foremen in their shops and over half

*Abstract of an address before the Car Foremen's Association of Chicago on November 14, 1927.

of them are engaged in car maintenance. You can therefore realize that you are very important indeed in the railroad industry. The total annual bill for the maintenance of cars is about $621,500,000, and you foremen are in direct charge of that expenditure. Of this amount about two-thirds is spent for labor and one-third for material. The expenditures of the railroads for car department labor are over $400,000,000 a year and for materials $200,000,000. The mere work of maintenance of cars, the investment that has to be made to carry on that work, would make it one of the very largest industries in the country if it were entirely a separate industry. It gives you some idea of the magnitude of the railroad industry when we realize that you are only one branch of a single department, and that nevertheless you spend more than six-hundred-million-dollars each year in the conduct of your business. When this is divided by the number of cars it does not sound so big. The average cost of maintaining a freight car is about $220, of which about $146 goes for labor and about $73 for materials.

Any department that is spending over $600,000,000 a year can cause great waste if the management is not good and great savings if the management is good. Whether or not the car department of the railroads will be well conducted and will operate with maximum efficiency and economy—whether the labor paid for and the materials used will be employed economically and efficiently—will depend largely on the car foremen.

Shop efficiency increasing

It is not necessary to tell you that there has been within recent years a very great improvement in the attitude of the labor employed in railroad shops. Railroad equipment is today being kept in better condition than a few years ago at smaller cost and with less labor. That necessarily indicates more efficient work by employees. Anybody who is familiar with railroad work knows that the efficiency of a shop depends perhaps on three factors. First, the supervisory officers. Second, the morale of employees. Third, the equipment of the plant. Capital equips the plant, providing the tools, buildings, etc., and thus determines the efficiency with which labor can work. Foremen have no more important duty than that of studying the equipment with which they are provided, and being frank and earnest in their recommendations to their superior officers for improvements.

A few months ago I worked up some figures and found that the amount of capital invested in our railroads per man employed increased about 61 per cent in the last 20 years. For each man employed by the railroads in 1906 there was an investment of $8,000. In 1926 the figure per man was over $13,000. Meantime the average output of transportation service per employee increased 57 per cent. Statistics regarding the average increases in tractive power of locomotives and capacity of freight cars per employee told the same story. The only conclusion was that the output per employee had increased in proportion to increases in the capacity of the plant made by the investment of capital. The investment of capital would have effected no economies at all if it had not saved material, fuel and labor.

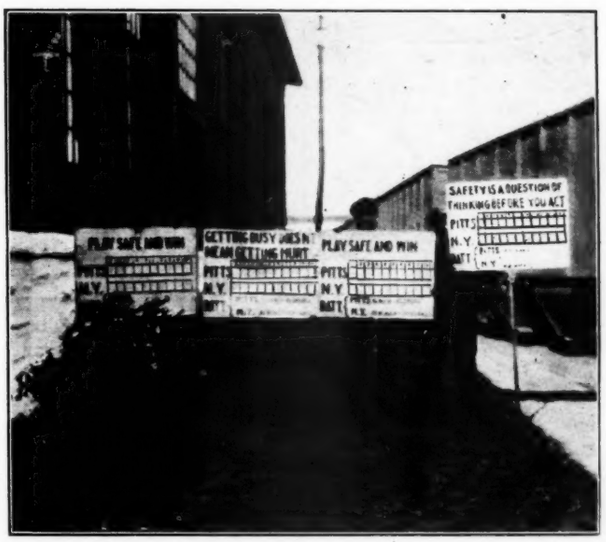
The world has been surprised at the rapidity with which the United States has recovered from the war and at our recent prosperity. They have sent delegations over to see us and find out why it is. Some of them have reported that the secret has been the high wages we have paid. As a matter of fact, that is simply reversing cause and effect. The high wages we are paying are due to the prosperity we enjoy; our prosperity is due to the relatively great output of our industries per man-hour of labor employed; and our great output per employee is mainly due to the vast amounts of capital that have been invested in our industries to enlarge and improve them. In all the world America leads in "mass production." In all the world there is no greater industry than the railroads of the United States, which were the first real mass producers. Anybody who has contrasted our locomotives and our cars with the small equipment on the railways on the other side of the Atlantic will bear me out in saying that our railroads surpass all others in the mass production of transportation. The amount of capital that has been invested in our railroads, and the way it has been invested, furnish the explanation.

Two vital problems

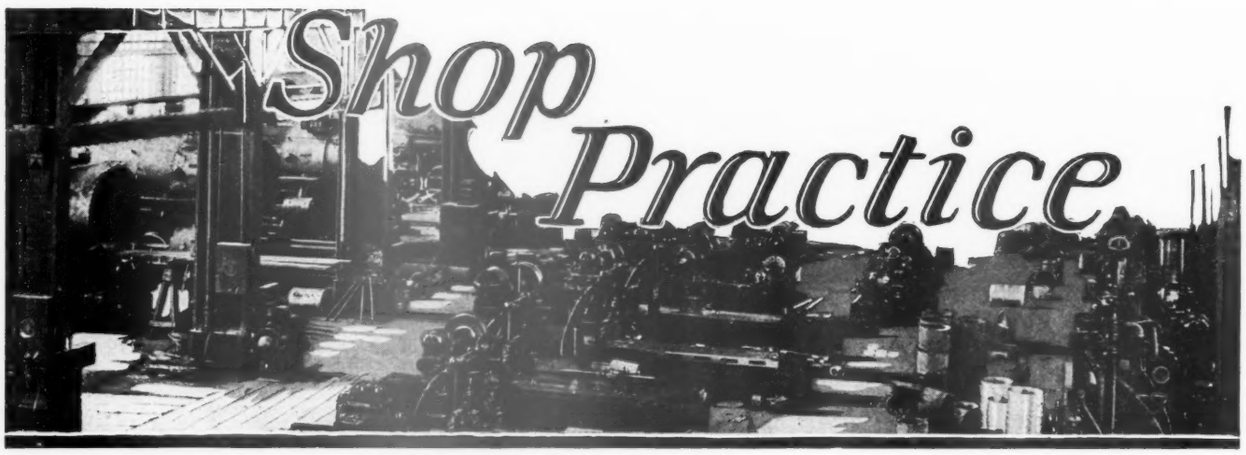
The two greatest problems of the railroads are those of getting public sentiment in favor of regulation that will assure reasonable profits, and a disposition on the part of every employee that will cause him to give the most efficient labor for a day's wage. My own conviction is that all the facts indicate that no class of people in the country has as much to gain from reasonable regulation and efficient operation as the employees of the railroads. Their wages must be paid from the earnings and the larger the earnings taken in by the railroads per man employed the larger can be the amount that they pay per man.

A most curious phenomenon has been that of leaders of railway labor unions working with those seeking to reduce the earnings of the railroads and at the same time seeking advances in the wages that must be paid from earnings.

The future of our railroads is mainly in the hands of their officers—not only the higher officers, but the supervisory officers and foremen. You can exert a great deal of influence both on public opinion and efficiency of operation.



These signs, showing the score and batteries, were carried after each inning through designated areas of a car shop and engine terminal on an eastern road during the 1927 world's baseball series—This feature was not only a time saver but was keenly appreciated by the men



Machining and fitting up a special driving box

The use of proper gages, special tools, jigs and fixtures aid in securing accurate results

THE James driving boxes have several special features not to be found in the ordinary type of driving box. The crown brasses can be renewed without dropping the wheels and can also be adjusted for wear.

When machining the driving boxes from the rough castings, they are faced on both sides. This operation can be done on planers in lots of six or more, or on an Ingersoll planer type slab miller. After the boxes have been faced they are laid off as shown in Fig. 1. The layout shown is for a standard 11-in. journal with a limit for wear of ¾ in., which will reduce the size of the journal to 10¼ in. The size of the box on the center line of the journal, when slotted, is $14\frac{7}{16}$ in. The box is slotted $1\frac{5}{8}$ in. below the journal center line. The boxes should be laid off with a template, working from the center line of the journal and the vertical center line, parallel with the shoe and wedge faces of the driving boxes. The boxes should be slotted with a ⅛-in. radius in the corners and a ⅛-in. angle on the lip or toe for the crown brass fit. The boxes should be checked before and after the crown brasses have been bored so that they will be parallel and central.

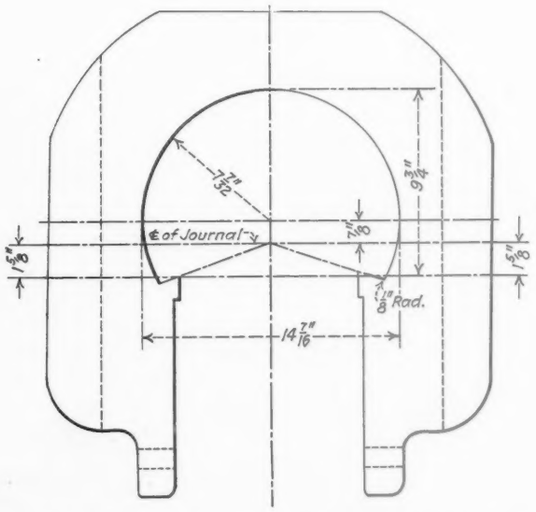


Fig. 1—Method of laying out the James driving box for slotting

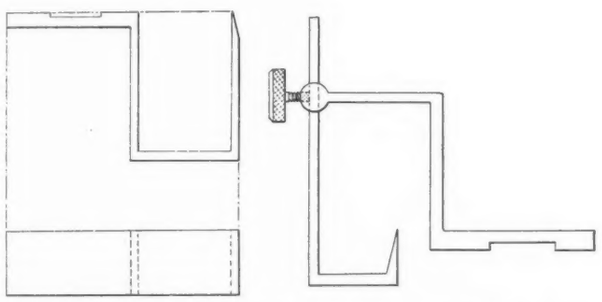


Fig. 2—A gage used for checking the driving boxes so that they will be machined central with the shoe and wedge faces

The boxes are then slotted on the inside with a taper of $\frac{5}{16}$ in. in 12 in. To do this, the slotter table is elevated. The gib on one side of the table is removed and two steel wedges are inserted under the table or ways. The set screws are then tightened sufficiently to prevent the table from working under the cutting stroke. The box is then set up to the lay out lines and slotted in the usual manner. The tool must be set to cut on the same side of the table under which the wedges are placed. The relation of the tool with the work must not be changed. The diameter of the inside of the driving box

after it has been finished is 5/8 in. larger at the top than at the bottom in a distance of 12 in. After the driving box radius has been machined, the wedges are then removed, the gib replaced and the cellar fits machined in the usual manner. After the boxes have been machined on the inside they are set up on the planer against a large angle plate in lots of six or more. The shoe and wedge faces are machined in the usual manner. The rock is then planed. If an Ingersoll planer type slab miller with two side heads is available much better time can be made on the boxes. If the boxes have brass liners on the shoe and wedge faces, the application and machining of these can be handled in accordance with the local shop practice. When machining the driving boxes on the shoe and wedge faces they must be machined absolutely central with the inside. For checking the accuracy of this operation, the gages shown in Fig. 2 are used. The boxes are first laid off in the usual manner and checked

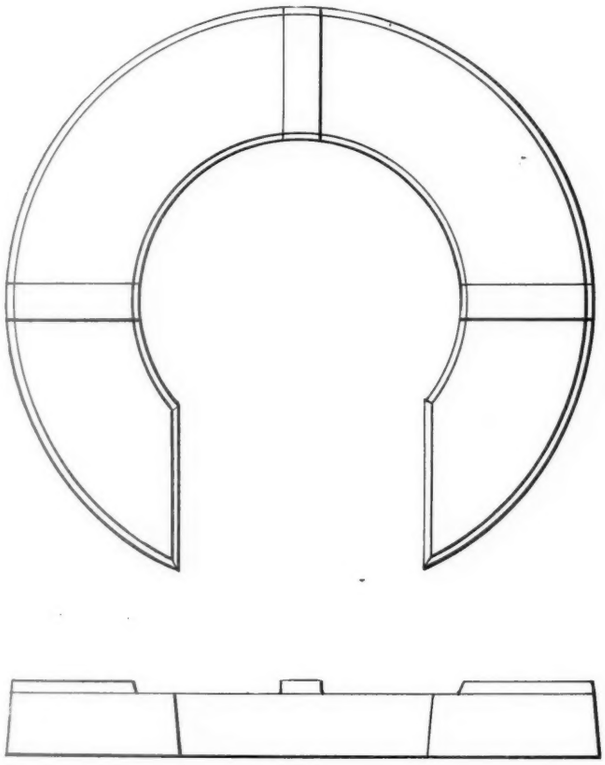


Fig. 3—A form used for pouring the bronze hub liners

in the process of machining to be sure that they will be absolutely central with the inside when finished. When this operation has been completed, if brass liners are to be poured on the shoe and wedge faces of the boxes, they are dove-tailed and drilled for anchor holes and then sent to the bronze shop. If the hub faces are to be bronzed also, these faces are dove-tailed. The form shown in Fig. 3 will be found handy for this work. It is made of ¼-in. by 2-in. flat iron and is held in position by several small clamps. It is advisable to have from 12 to 24 of these forms, depending on the number of the boxes to be bronzed. The boxes are then machined on the shoe and wedge and hub faces to standard dimensions.

The boxes are then laid off with a template and drilled and tapped for the five 7/8-in. wedge studs and also drilled for the cellar bolts and oil holes. The next operation is to mill the small recess shown in Fig. 4 to accommodate a small lug on the crown brass to prevent the brass from working into the hub and causing hub wear and possibly a hot bearing. The boxes are then stencilled with the position and engine number as well as any other information it is desired to show. The cellars are then machined to fit the respective boxes. This work is handled in the usual manner. It should, however, be

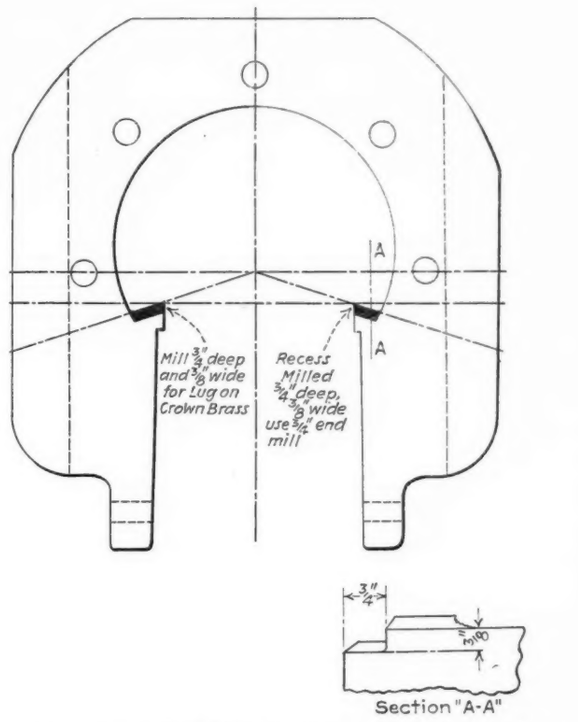


Fig. 4—A method of milling the recesses in the driving boxes to accommodate the lugs on the crown brasses

remembered that the cellars will have to be cut off on account of the brasses dropping 1 5/8 in. past the center line of the journals.

Machining the wedges

The purpose of the patented cast steel wedge shown in Fig. 5, is to provide a means of making an adjustment for crown brass wear and to take up lost motion and

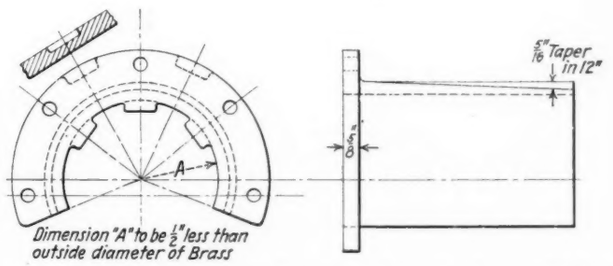


Fig. 5—The cast steel wedge applied to the James driving box

eliminate pound in the driving box without the necessity of dropping the driving wheels. When the wedges have been adjusted to their maximum limit, they are replaced by thicker wedges. They can, in some cases, be shimmed although this practice is not recommended. These wedges are machined on a lathe as shown in Fig. 6. It is clamped to the face plate of the lathe, the half circle clamp shown is used to prevent the wedge from

slipping while taking heavy cuts. A cutter head with two tools is mounted on a spindle which is held in the tail stock of the lathe, and is prevented from turning by a steel pin which goes through the bar and fits into a slot cut in the lathe tail stock spindle. The bar is piloted by a bronze bushing that is fitted into the lathe spindle. The tail stock clamps are loosened up just enough to permit the tail stock from sliding freely and

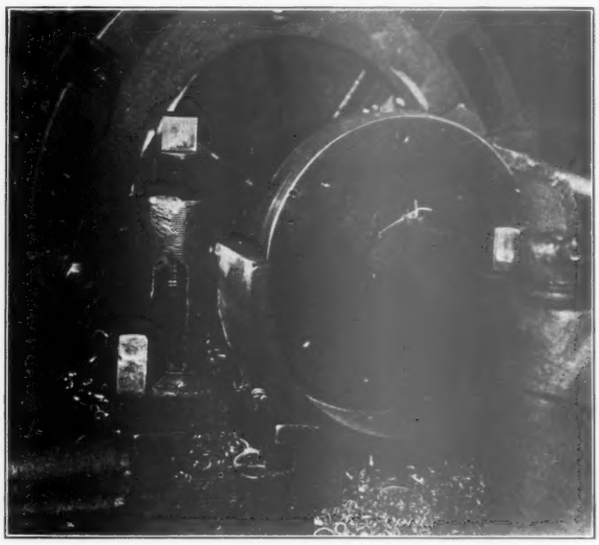


Fig 6—Machining the cast steel wedge on an engine lathe

it is then clamped to the lathe carriage. The taper attachment of the lathe is set for the desired taper and the tool in the tool post is fed in for the depth of the cut to be taken on the outside of the wedge. The tools in the cutter head are set for the depth of cut to be taken on the inside of the wedge. When the carriage feed is put on it feeds the cutter head as well as the

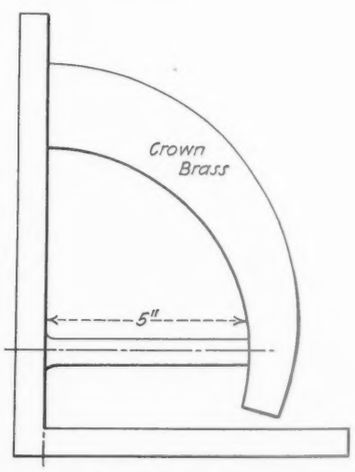


Fig 7—A gage used for laying off the crown brass halves

tool post because the tail stock, which carries the cutter head, is attached to the carriage.

The time for machining the steel wedges in this manner has been reduced to one third of the time it took to do the work on a boring mill, which was about 15 hours. The wedges can be done on a lathe in 5 hours or less, depending on their size. The next operation on the wedges is to lay them off for machining to fit the driving boxes. The machining of the wedges for the driving box fits can be done on a slotter or shaper.

The driving boxes, the cellars and the steel wedges are now finished. The next operation is to machine the crown brasses, which are cast in two parts. The first operation is to face the brasses where the two halves come together, using the gage shown in Fig. 7. Next, both ends of the brasses should be machined off square. This can be done to good advantage on a Lucas horizontal boring mill using a facing cutter of about 12 in. in diameter. The brasses are then milled for tool clearance using a ¾-in. end mill in a Lucas horizontal boring mill. This operation is shown in Fig. 8. The brasses are then placed on the fixture shown in Fig. 9 which was designed for use on a Niles 36-in. vertical boring mill. The brasses are turned to fit the inside of the cast steel wedges. The pointer at the top of the fixture is used to set up the brass, this being done

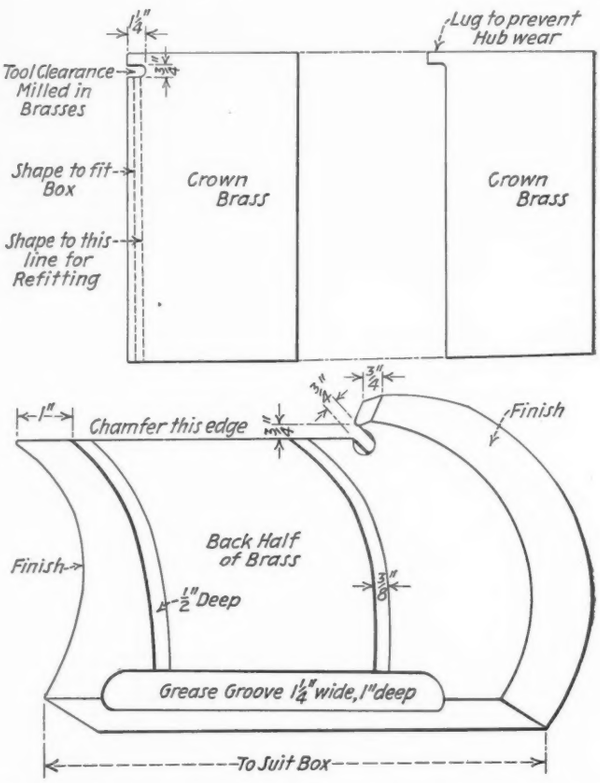


Fig. 8—Method of milling the crown brasses to provide a lug on the brass and tool clearance

before starting the machine. The pointer slips in and out of the drilled hole in the top of the fixture. This facilitates the set-up and machining of the crown brasses and saves considerable time as the operator can set up the brass and tighten all set screws before the machine is started. The brasses are stencilled on the face of each half for the box they are to fit. The wedges also are stencilled to correspond to the numbers on the boxes that they are to fit.

The crown brasses have now been turned on the outside; the next operation is to lay the brasses off and slot them to fit the boxes. The brasses are slotted using the device shown in Fig. 10. By placing two pieces of flat iron between the set screws and the brasses, both halves of the brasses can be set up at one time in this device and slotted. The brasses should be left about 1/16 in. full, which means

1/32 in. on each side, until after they have been bored. The brasses are pressed into the boxes just tight enough to hold them while being bored for the journal fits, after which they are removed and fitted to the boxes so that the wedges will stand off from 5/8 in. to 3/4 in. from the

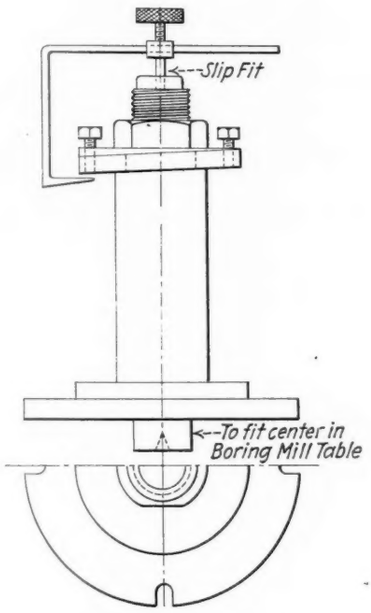


Fig. 9—A fixture used for turning the crown brasses on the outside so that they will fit in the steel wedges

face of the boxes when the box is fitted to the journal. When the brass has been fitted, the grease cavities should be machined, using a Lucas machine. Local shop practices will govern the kind of grease grooves to be used. The crown brasses can be faced to the proper length

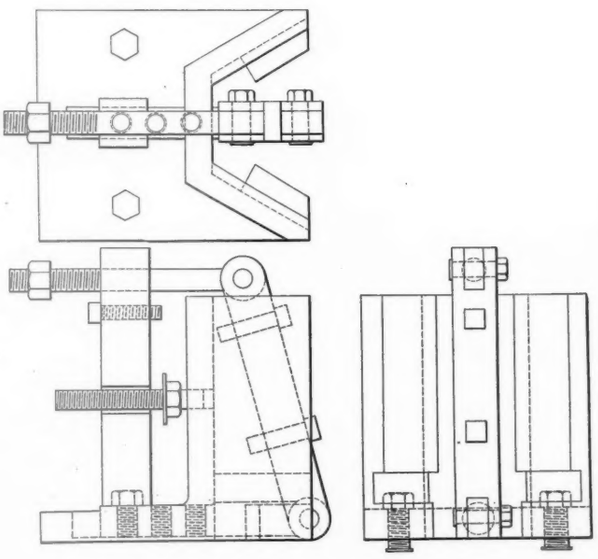


Fig. 10—A jig used for slotting crown brasses

while being bored for the journal fit. They should be bored the same as for any other boxes. If it is shop practice to bore the boxes 1/64 or 1/32 in. larger than the journals, the James boxes can be bored to the same tolerances.

Assembling the driving box on the axle

A good tool for machining the grease grooves in the crown brasses of these boxes was shown on page 292 in the May, 1927, issue of the *Railway Mechanical Engineer*. If no other means are available for doing this work, the grooves can be chipped with a pneumatic hammer. As the boxes shown in the illustrations are for 11-in. journals, the brasses should be machined for the minimum size of the journal, which would be 10 1/4 in. in diameter. The crown brasses have now been completed and the boxes are ready to assemble. The journals should receive an application of heavy oil, the grease grooves in the crown brasses filled with grease and inside of the driving box well lubricated with heavy oil. The inside and outside of the steel wedge should also be well lubricated. The two halves of the crown brass are placed on the journal, the steel wedge is placed over the brass and entered in the driving box and driven in place with a copper hammer. The nuts are then placed on the studs and the wedge is drawn up until the box can be turned free on the journal. At this point the wedge should stand away from the face of the box 5/8 in.

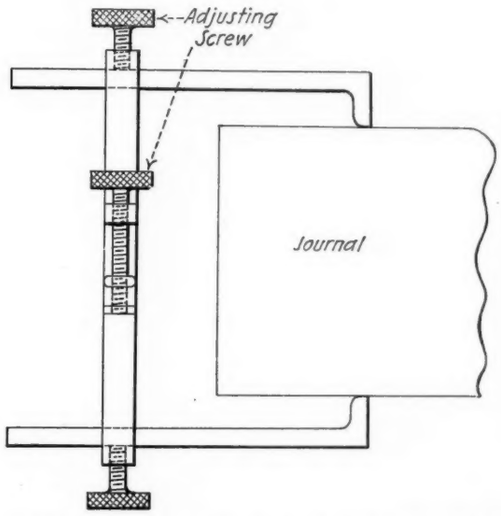


Fig. 11—Special outside calipers used for obtaining the size of the journal when the box is not removed

If this distance is more than 5/8 in. or less than 5/8 in., the brass should be refitted or a thicker wedge placed in the box to give the proper draw on the wedge for adjustment. After the wedge has been properly adjusted, the lock washers and nuts are then placed on the studs and the nuts properly tightened. For keeping an accurate record of the wear of the crown brasses, the date should be stencilled on the outer edge. The grease cellars and the end gates are applied to the boxes in the usual manner. The boxes are packed in the same manner as ordinary boxes.

A hole drilled in the outside end of each crown brass will be found handy when working on these boxes in the enginehouse. By screwing eye bolts in the holes, the brasses can be quickly removed. Also two 3/4-in. tapped holes in the cast steel wedges fitted with set screws about 3-in. long will be found useful in pulling the wedges from the driving boxes while making adjustments on the wedges or the brasses.

The gage shown in Fig. 11 is used for setting up the driving boxes on the boring mill to insure the brasses being bored 1 5/8 in. below the center line of the journals, as this is an important feature of the James driving

boxes. With the ordinary driving box that is bored on the center line of the journal, there is a tendency for the box to raise on the journal while the engine is working steam. This action produces a bad pound in the driving box. With the James type of driving box this is prevented owing to the crown brass extending below the center line of the journal 1⅝ in. or more if desired. The gage shown in Fig. 11 is placed in the tee slot in the center of the boring mill table and the edge of the crown brass lined up with the edge of the gage. Then the brass will be correctly bored after lining with the gage, thus eliminating chances for hot boxes.

The readers should not get the impression that all the gages, tools and special devices shown have to be made for use on the James driving boxes. The purpose of showing these gages is to convey the idea that better work can be done and the work handled with more ease, dispatch and less expense if the driving boxes are handled as outlined in this article. Many of the gages, special tools, jigs and fixtures and other devices can be used in connection with the fitting up and machining of other types of driving boxes.

New Haven inspection system reduces engine failures

Inspection division does not report to the maintenance department—Co-operation has made the plan feasible

IN August, 1923, the New York, New Haven & Hartford put into effect in its steam locomotive repair shops, a system of locomotive inspection which contains several unique features. The outstanding deviation from the usual inspection system is that, instead of reporting to the maintenance officer in charge of the shop or engine terminal, the inspection division reports directly to the mechanical manager.

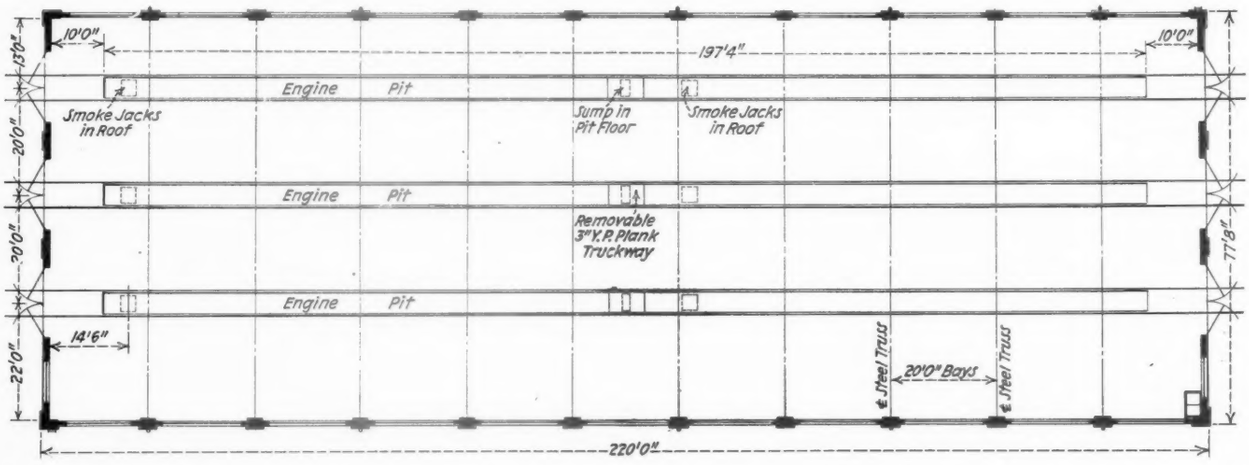
The inspection forces come under the supervision of chief mechanical inspectors, one in charge of each principal shop or territory. Each of the principal engine terminals is directly supervised by a general foreman mechanical inspector or foreman inspector. All matters pertaining to inspection, together with the supervisors having to do with the various related activities, such as the supervisor of boiler maintenance and inspection, valve specialist, supervisor of equipment lighting, general train control inspector, supervisor of pit inspection and lubrication, supervisor of automotive equipment, etc., come under the inspection division. In addition, reports and records are a part of the duties.

Shortly after the system was put into effect in the steam locomotive shops, it was extended to cover all engine terminals and gradually the other various types of equipment; i.e., electric locomotives, freight and passenger equipment cars, gas rail cars, work and industrial equipment and marine equipment.

The personnel

At the time the system was inaugurated, the personnel was selected from the mechanical department. Inspectors were recruited from the ranks, great care being exercised to select men with adequate experienc, tact and personality. It was especially necessary to train the men to use sound judgment and in the use of rules, instructions, standards, etc., so that they might work intelligently and co-operate fully with the foremen in charge of the various departments.

The main steam locomotive repair shop is located at Readville, Mass., about ten miles from Boston. When a locomotive arrives at the shop, it is inspected in the yard by boiler inspectors to check the report received from the enginehouse inspectors, as to apparent boiler work necessary. While on the stripping pit in the shop, hydrostatic tests are given to the cylinders, steam pipes, units, etc., and at the same time all important parts are



A plan view of the locomotive finishing shop recently built at the Readville shops of the New York, New Haven & Hartford

inspected by a stripping inspector who writes up on a standard form the necessary work or renewals. In some cases, final inspection must be delayed until the parts have been through the cleaning vat.

The inspection force at Readville is made up as follows:

No.	Title of inspector
1	Chief
1	Stripping
4	Boiler
5	Machinery
2	Accessory
2	Tender
3	Finishing

Inspectors are located in the various departments throughout the shop, following closely all parts for de-

THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY

Master Mechanic's Report of Steam Locomotive Failure

_____ 192__

Date of Failure_____ Train No._____ Locomotive No._____

Time Lost_____ Engineer_____ Fireman_____

Following questions shall be answered by M. M. Dispatching Locomotive:

1 Cause of failure?

2 Who was foreman responsible?

3 Did work book show that defect causing failure had been reported after previous trip?

4 If so, what work was done?

5 If not, what work was done on part causing failure?

6. Had this locomotive as dispatched by you, failed within the last ten days?

7 If so, what dates?

8. What was cause on each date?

9 If failure was caused by neglect on the part of anyone, what action was taken?

_____
Master Mechanic

Following questions shall be answered by M. M. Receiving Locomotive

10. If failure was due to low steam, what was cause?

11 What work was done?

12 How do you know Engineer and Fireman were competent?

_____
Master Mechanic

The master mechanic must fill out one of these forms and send it to the mechanical manager every time a locomotive fails

fective material or workmanship and co-operating closely with the department foremen to determine that standards are being adhered to. Stipulated tests of important parts, hydrostatic, steam and fire tests are witnessed by the inspectors and the necessary reports made.

New locomotive finishing shop

It was formerly the practice at Readville when locomotives came off the repair pits, to place them on various tracks in the yard for final inspection and adjustment. This system was not satisfactory inasmuch as it was necessary for the shopmen to leave their work to make the final repairs called for by the inspectors' reports. This was unsatisfactory both to the workmen and the management.

This situation has been overcome by building a locomotive finishing shop to which all locomotives are sent for final inspection, testing and repairs. This shop, which is located parallel to the south side of the blacksmith shop, is built of brick, steel and glass. The shop is 220 ft. long by 77 ft. wide and contains three engine pit tracks 197 ft. long. The shop force consists of the following:

No.	Title
2	Machinists
1	Machinist helper
4	Pipemen
4	Pipemen helpers
4	Clampers
2	Truckmen
2	Inspectors

The locomotives are broken in on a slipping track about 1,000 ft. long. This track is located along the south side of the finishing shop. Formerly, the locomotimes were given their trial on an 18-mile run, which proved expensive and did not give the desired results. After an engine has been connected to its tender and fired up, it is placed on the slip track which is oiled from two containers temporarily attached to the locomotive breast beam. A regular engine crew is assigned to operate the engines. The engines can be run at the equivalent of from 15 to 60 m.p.h. and still move along the track at a very slow speed. This method of testing brings out the machinery and boiler defects more quickly than running the engines on the road.

While on the slipping track the engine is under the supervision of a finished locomotive inspector, who

THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY
CENTRAL NEW ENGLAND RAILWAY COMPANY
MECHANICAL DEPARTMENT

PRELIMINARY MATERIAL WRITE-UP OF STEAM LOCOMOTIVE FOR SHOP

Location_____ Loco No _____ Class_____
Date of Inspection_____ Class of Repairs_____ Date due in Shop_____
Service (Freight, Passenger or Switcher)_____

The above locomotive and tender have been inspected and the important parts requiring renewal at next shopping are indicated below.

Out of Shop - Loco	Cab
Out of Shop - Tender	Pilot
Last Date, Hydro.	Large Castings
Last Date, Flues	Ashpan
Last Date, Caps	Boiler
Last Date, Lagging	Smoke Box
Last Date, Air Pump Applied	Firebox
Was Internal Insp Made of Boiler	L Side Sheet
Was Hydro Test Apld to Cylinders	R Side Sheet
Wheel Centers	Back Flue Sheet
Wheels	Front Flue Sheet
Tires-Driver	Crown Sheet
Tires-Trailer	Door Sheet
Driving Axles	Inside Throat Sheet
Engine Truck Axles	Outside Throat Sheet
Trailer Truck Axles	Combustion Chamber
Tender Truck Axles	L Wrapper Sheet
Crank Pins	R Wrapper Sheet
Driving Boxes	Roof Sheet
Engine Truck Boxes	Back Head
Driving Box Bearings	Back End
Main Rods	Flues
Side Rods	Arch Tubes
Crossheads	Tender Trucks
Piston Rods	Tender Frame
Piston Heads	Side Frames
Guide Bars	Bolsters
Guide Yokes	Center Plates
Cylinders	Draw Castings
Engine Frames	Cistern
Cross Ties	

MISCELLANEOUS:_____

REMARKS._____

_____ Mech Insp.-Boiler

_____ Boiler Foreman.

_____ Mech. Insp.-Machy.

Preliminary material write-up of locomotives for shopping, made by the inspectors

makes note of all defects and issues defect slips as may be necessary to the finishing foreman. When the locomotive is finally ready for delivery, i.e., an inspection defect slips satisfactorily cleared, the cab cards are signed and sworn to by the inspectors and a written release issued to the general foreman of the shop by the chief mechanical inspector.

The system has worked out very satisfactorily in the shops. In case of a dispute between an inspector and

foreman, the chief inspector and general foreman are called together and the matter thoroughly gone into, at which time a decision practically without exception is arrived at. The main point to observe is that neither the inspection nor maintenance department has the authority to arbitrarily overrule the other. Instead, any disputed point is referred and settled as above.

The boiler inspectors are required to make detail boiler condition reports on standard forms, which are forwarded to the supervisor of boiler inspection and maintenance, so that a complete record is available at any time and so that necessary boiler parts or boilers may be anticipated for the next shopping.

Other machinery records such as counterbalancing, quartering, dimensions of certain parts, etc., are tabulated and maintained by the inspection division.

Inspection at engine terminals

At engine terminals, the inspectors, including the foremen, not only inspect for defects, but also make repairs to a certain extent, depending upon the nature of the defect. The organization is composed of machinery, air brake, boiler, headlight and train control inspectors. Table I shows the organization of the inspection forces

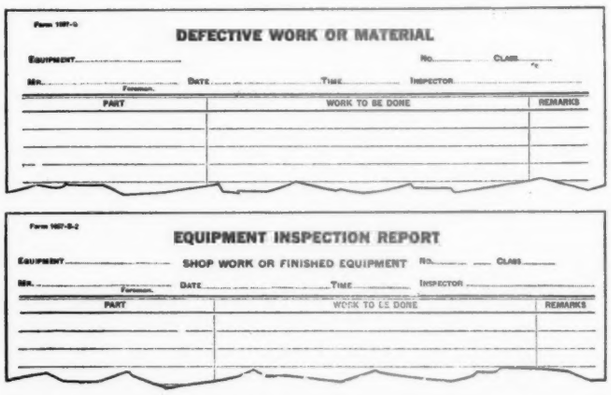
Table I—Locomotive inspection organization at Cedar Hill enginehouse

General foreman mechanical inspector

1	2	3
Pit inspection Tricks		
1 Foreman	1 Foreman	1 Foreman
1 Airbrake inspector	1 Airbrake inspector	1 Airbrake inspector
1 Ground inspector	1 Ground inspector	1 Ground inspector
1 Pit inspector	1 Pit inspector	1 Pit inspector
Boiler wash inspection		
1 Machinery inspector 1 Boiler inspector 1 Airbrake inspector	1 Machinery and air-brake inspector	1 Machinery and air-brake inspector
Headlight and train control inspection		
2 Headlight inspectors 1 Train control insp.	1 Headlight inspector 1 Train control insp.	1 Headlight and train control inspector

located at Cedar Hill enginehouse at which approximately 100 locomotives are turned daily. They are under the supervision at the larger terminals of a general foreman mechanical inspector, and at the smaller terminals, a foreman mechanical inspector. At the larger terminals, the inspection is made while the engine is on an inspection pit located outside of the enginehouse. Each shift is under the direct supervision of a foreman mechanical inspector and daily inspection is in accordance with I. C. C. rules and regulations and the New Haven standards. Such repairs as can be made on the pit are made as found, and the balance are reported in the usual inspection book and a copy of the write-up sent through a pneumatic tube to the enginehouse, arriving there in advance of the engine, so that necessary slips may be issued to the foremen. A considerable portion of the daily maintenance work is performed on the inspection pits and only the heavier work done in the enginehouse. This results in many engines being ready for service as soon as they have passed over the inspection pit.

The inspectors detailed on headlight and train control work also maintain this equipment making it unnecessary for the regular maintenance forces to give this equipment any attention.



DEFECTIVE WORK OR MATERIAL

Equipment ..... No. ..... Class .....

Mr. ..... Foreman. Date ..... Time ..... Inspector .....

PART	WORK TO BE DONE	REMARKS

EQUIPMENT INSPECTION REPORT

SHOP WORK OR FINISHED EQUIPMENT

Equipment ..... No. ..... Class .....

Mr. ..... Foreman. Date ..... Time ..... Inspector .....

PART	WORK TO BE DONE	REMARKS

The top form is filled out by the inspectors when the material or workmanship is found defective. The bottom form is issued by the inspectors when locomotives or parts in the shop are examined for defects and repairs

THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY

Mechanical Department

MONTHLY INSPECTION AND TEST OF FIRE FIGHTING APPARATUS ON SWITCH ENGINES

Location_____

Date_____

Engine Number_____

Pounds Pressure (Approximate)_____

Was Test Satisfactory?_____

Hose Wrench, Spanner & Nozzel Provided?_____

_____

Condition of Hose?_____

Condition of Hose Fittings?_____

Was Hose Dried After Test?_____

REMARKS:

_____

Gen. Fore. Mech. Insp.

NOTE: To be filled in monthly and sent to Master Mechanic; copy to Supt. of Insurance, New Haven, Conn.

The findings of the inspectors of fire fighting apparatus on switch engines are set down on this form

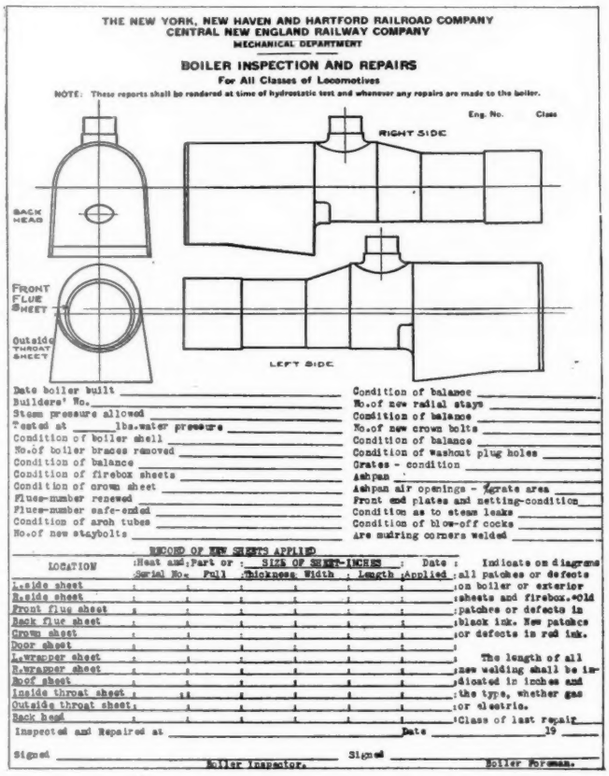
At boilerwash period, a separate set of inspectors, called boilerwash inspectors, enlarge upon the write-up received from the inspection pit and completely write up each locomotive. The write-up is hung on the front of the locomotive or on the wall and the various foremen consult it for the necessary work to be performed. As the items are completed, they are checked off by the foremen and when all the items have been repaired, the inspector checks each one to determine that it has been done and properly done. A certain minimum percentage of the items of work reported, including all I. C. C. defects, must be performed by the maintenance force on each engine before it may be dispatched. All cab cards are signed and sworn to by the inspectors.

Needless to say, the washout inspectors determine that

the boilers are thoroughly washed out and that the boiler fittings are removed and thorougly cleaned as well as determine that all necessary tests have been made as prescribed by law. The washout plugs are not applied to a boiler until the inspector has been notified and his permission obtained.

It has been found that a thorough inspection and repair at the boilerwash period, which on the New Haven is necessary generally at 30-day intervals only, insures good performance and minimum of maintenance during the following 30 days.

Locomotives are set up for shopping by the shopping



THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY
CENTRAL NEW ENGLAND RAILWAY COMPANY
MECHANICAL DEPARTMENT

BOILER INSPECTION AND REPAIRS
For All Classes of Locomotives

NOTE: These reports shall be rendered at time of hydrostatic test and whenever any repairs are made to the boiler.

Eng. No. Class

RIGHT SIDE

BACK HEAD

FRONT FLUE SHEET

Outside THROAT SHEET

LEFT SIDE

Date boiler built _____ Condition of balance _____
Builders' No. _____ No. of new radial stays _____
Steam pressure allowed _____ Condition of balance _____
Tested at _____ lbs. water pressure _____ No. of new crown bolts _____
Condition of boiler shell _____ Condition of balance _____
No. of boiler braces removed _____ Condition of washout plug holes _____
Condition of balance _____ Grates - condition _____
Condition of firebox sheets _____ Ashpan _____
Condition of crown sheet _____ Ashpan air openings - % grate area _____
Flues-number renewed _____ Front end plates and netting-condition _____
Flues-number safe-ended _____ Condition as to steam leaks _____
Condition of arch tubes _____ Condition of blow-off cocks _____
No. of new stayboltz _____ Are mudring corners welded _____

RECORD OF NEW SHEETS APPLIED

LOCATION	Heat and Serial No.	Part or Full	SIZE OF SHEET-INCHES Thickness	Width	Length	Date Applied	Indicate on diagrams all patches or defects
L. side sheet							on boiler or exterior
R. side sheet							sheets and firebox. Cold
Front flue sheet							patches or defects in
Back flue sheet							black ink. New patches
Crown sheet							or defects in red ink.
Door sheet							
L. wrapper sheet							The length of all
R. wrapper sheet							new welding shall be in-
Roof sheet							dicated in inches and
Inside throat sheet							the type, whether gas
Outside throat sheet							or electric.
Back head							Class of last repair

Inspected and Repaired at _____ Date _____ 19____

Signed _____ Boiler Inspector. Signed _____ Boiler Foreman.

This is one of several forms filled out by the boiler inspectors to keep a record of boiler conditions

committee six months in advance. Three months prior to the shopping date, the enginehouse inspectors make a thorough inspection of the locomotive and boiler to determine what boiler repairs will be necessary and what important locomotive parts will require renewal. This write-up is forwarded to all concerned including the storekeeper at the shop so that necessary parts may be on hand at the time the locomotive arrives at the shop.

At both the shops and engine terminals, a system of reporting cracked and broken parts has been placed in effect whereby the inspectors report such parts, the information being tabulated currently and periodically reported to the mechanical engineer, so that any necessary attention from the standpoint of design or material may be given. This has resulted in quickly locating weak spots and correcting the trouble, thus assisting to reduce failures to a minimum.

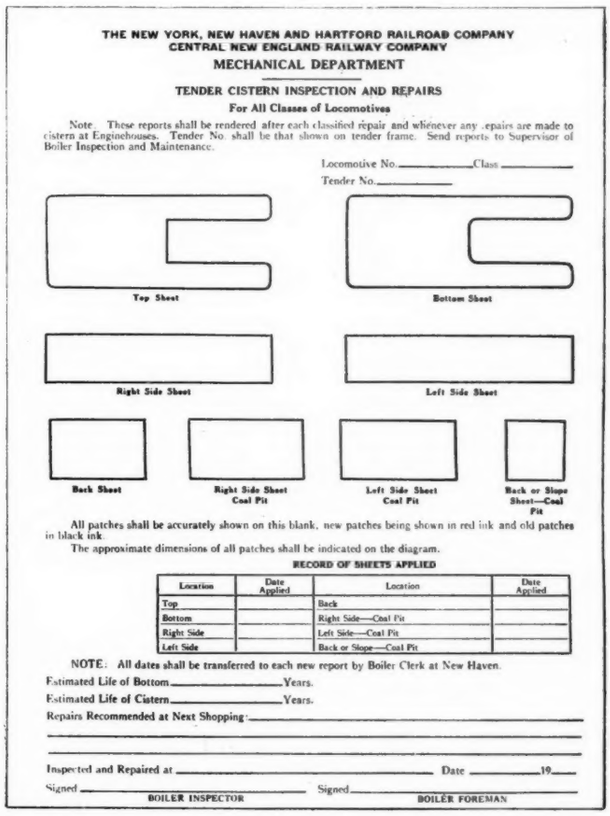
At the inspection pits, the employees having to do with lubrication are under the jurisdiction of the inspection division, and it is their responsibility to see that all oiling and greasing is properly attended to. The supervisor of lubrication has jurisdiction over all lubrication at engine terminals and determines that the standard methods and practices which have been worked out are adhered to.

Automotive equipment

The New Haven operates a considerable number of gas rail cars and it was early determined that constant and thorough inspection was necessary in order that maintenance might be such as to reduce failures to a minimum and keep the equipment in service.

The inspection system was accordingly installed in the main shop where heavy repairs are made to this equipment, and also at various points on the road where lighter repairs are made. The inspectors detailed on lighter repairs are required to travel to the smaller points where the cars are put up, the endeavor being to inspect each car at least once a week. These inspectors do considerable maintenance work in addition to inspection; instruct the regular maintainers and generally guide them in their work. They are also required to instruct and qualify the operators or engineers and until an operator has received a qualification card signed by the supervisor of automotive equipment, he is not permitted to operate a car.

The matter of engineering is closely allied with in-



THE NEW YORK, NEW HAVEN AND HARTFORD RAILROAD COMPANY
CENTRAL NEW ENGLAND RAILWAY COMPANY
MECHANICAL DEPARTMENT

TENDER CISTERN INSPECTION AND REPAIRS
For All Classes of Locomotives

Note These reports shall be rendered after each classified repair and whenever any repairs are made to cistern at Enginehouses. Tender No. shall be that shown on tender frame. Send reports to Supervisor of Boiler Inspection and Maintenance.

Locomotive No. _____ Class _____
Tender No. _____

Top Sheet

Bottom Sheet

Right Side Sheet

Left Side Sheet

Back Sheet

Right Side Sheet Coal Pit

Left Side Sheet Coal Pit

Back or Slope Sheet—Coal Pit

All patches shall be accurately shown on this blank, new patches being shown in red ink and old patches in black ink.
The approximate dimensions of all patches shall be indicated on the diagram.

RECORD OF SHEETS APPLIED

Location	Date Applied	Location	Date Applied
Top		Back	
Bottom		Right Side—Coal Pit	
Right Side		Left Side—Coal Pit	
Left Side		Back or Slope—Coal Pit	

NOTE. All dates shall be transferred to each new report by Boiler Clerk at New Haven.

Estimated Life of Bottom _____ Years.
Estimated Life of Cistern _____ Years.
Repairs Recommended at Next Shopping: _____

Inspected and Repaired at _____ Date _____ 19____

Signed _____ BOILER INSPECTOR Signed _____ BOILER FOREMAN

The form filled out by the tender inspectors

spection and inspectors have been working closely with this phase of the situation, all assisting to reduce out-of-service time to a minimum.

The shop at which heavy repairs are made performs the repairs to other gasoline operated equipment, such as speeder cars, tie tampers, compressors, etc., all of which work is passed on by the inspection division.

Marine equipment

The marine inspection consists of a periodic inspection of each unit of equipment after which condition reports

are made out and placed on file. The repairs made to the equipment at the New Haven and outside shipyards is performed in accordance with detail specifications prepared by the inspection division from the periodic reports and from the inspections made just prior to the equipment going into dry dock. While the work is being performed in the shipyard, it is under the supervision of an inspector who determines that all work called for by specifications is properly performed.

Tests of necessary materials and especially paints, are made through the inspectors selecting samples on the ground and forwarding them to the railroad's laboratory.

Tug boats or transfers are brought into the New Haven shipyard periodically for boilerwash and repairs and at that time are inspected and written up by inspectors, the reports being handed to the maintenance division. Inspectors are also used in making marine surveys covering damages and insurance matters. Their knowledge of the equipment, through their inspection efforts, fits them particularly well for this phase of the work.

Results

Utilization of equipment is an important factor in railroad operation and constant thought and study are necessary to bring and maintain utilization to the highest degree. Engineering, materials, proper inspection and repairs at the backshops and high standard of maintenance at terminals are vital factors affecting utilization. The inspection division was organized to assist in bringing about the desired result.

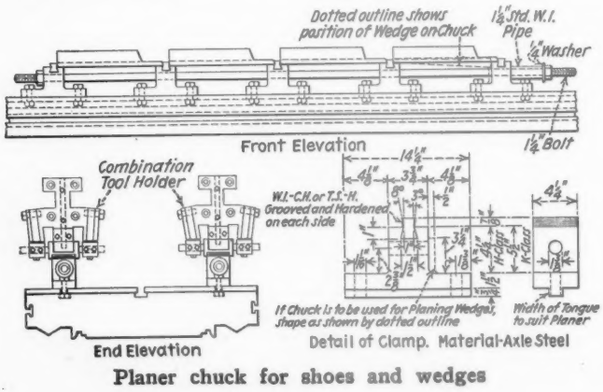
Locomotive failures have been greatly reduced and locomotive miles per failure accordingly increased to a point greatly in excess of any previous record. The miles per locomotive failure have increased ten times over the mileage obtained during the years immediately preceding the strike of 1922. Careful attention to wearing parts and to lubrication of such parts has resulted in a tremendous increase in miles per heating failure.

The result of federal inspection of locomotives has been materially improved. For the last fiscal year, the per cent of defective locomotives has been reduced to approximately one-half, and the per cent of locomotives ordered out of service reduced to about one-tenth of that reported in the years immediately preceding the strike of 1922.

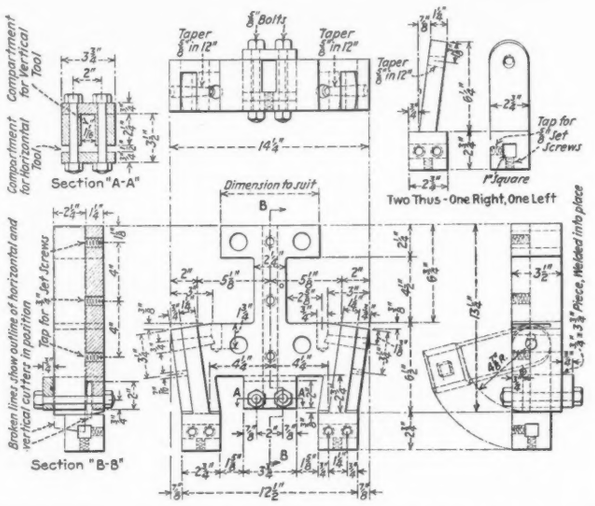
Machining shoes and wedges on a planer

By E. A. Miller

THE combination tool holder and chuck shown in the drawings is designed for machining shoes and wedges on a planer. The main tool holder is 3½ in. thick at the center and 16 in. long. The center tool is clamped in place by three ¾-in. set screws, as shown in section *B-B* of the drawing of the combination tool holder. The tools for machining the outside of the shoes are clamped in position by two horizontal and one vertical set screws. The two outside tool holders—one right and one left—are hinged to the main holder with ¾-in. taper pins. This arrangement permits the tools to be operated in much the same manner as a shaper, whereby the cutting tools are dragged on the return stroke. The width of the head of the main tool holder is determined by the location of the bolt holes and the size of the tool block on the planer. A roughing tool


Dotted outline shows position of Wedge on Chuck
1½" Std. W.I. Pipe
1¼" Washer
Front Elevation
1¼" Bolt
Combination Tool Holder
W.I.-C.H. or T.S.-H. Grooved and Hardened on each side
End Elevation
If Chuck is to be used for Planing Wedges, shape as shown by dotted outline
Width of Tongue to suit Planer
Detail of Clamp. Material-Axle Steel

Planer chuck for shoes and wedges

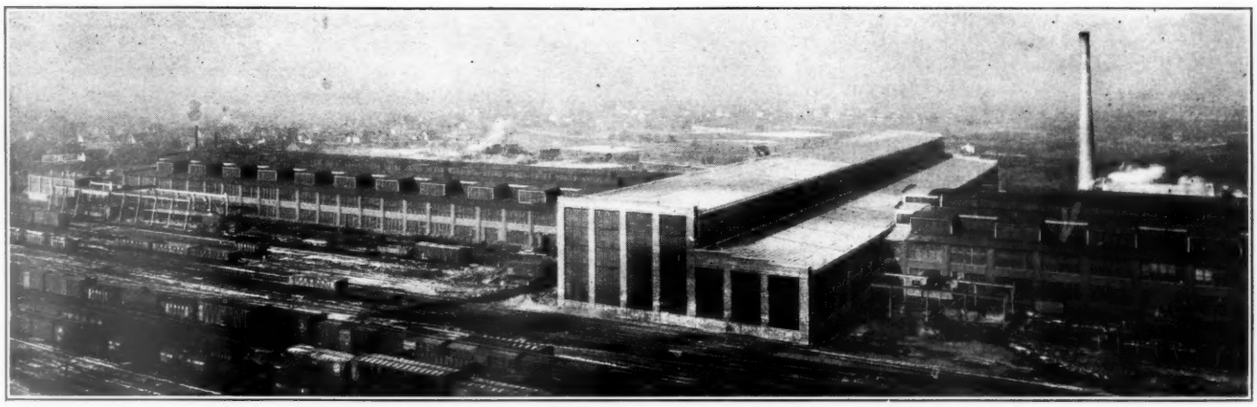

Compartment for Vertical Tool
Compartment for Horizontal Tool
Section "A-A"
Taper ⅝ in 12"
⅝" Bolts
Dimension to suit
Tap for ⅜" Set Screws
Two Thus - One Right, One Left
Broken lines show outline of horizontal and vertical cutters in position
Section "B-B"

Combination tool holder used when planing shoes and wedges

is used to rough out the center, sides and bottom. The inside finishing tool is a trifle wider than the roughing tool and is set a trifle lower. Only one tool, however, is used for all machining of the outside faces of the shoe.

The chuck for holding the shoes and wedges on the table of the planer is made of axle steel, 14¼ in. long, and is provided with a tongue to fit the slot in the bed of the planer. Each clamp is held to the bed of the planer by two 1-in. bolts as shown in the drawing. A grooved piece of case-hardened wrought iron or hardened tool steel is inserted between the shoes. A 1⅜-in. hole is drilled lengthwise through the base of each clamp, through which a 1¼-in. rod, threaded at each end, is inserted. The shoes are clamped in position by tightening the nuts at each end of the 1¼-in. rod. The wedges are clamped in position as shown by the dotted outline on the front elevation of the chuck. Ten clamps will hold eight wedges, all of which can be planed at one time. The number of chucks that can be clamped to the planer bed depends on whether the machine is equipped with one or two tool blocks.

LOCOMOTIVE PROGRESS.—Among the representative locomotives of recent design shown in a bulletin of 40 pages issued by the Superheater Company, 17 East Forty-second street, New York, are the Texas 2-10-4 type for the Texas & Pacific, the Hudson 4-6-4 type for the New York Central, the three-cylinder 4-12-2 type for the Union Pacific, the Northern 4-8-4 type for the Canadian National, and Baldwin Locomotive No. 60,000. General dimensions are given for each of the locomotives shown, also a brief description of some of the specialties with which they are equipped and the service for which they were built.



A new transverse shop introduced into the middle of an old longitudinal plant

Wabash enlarges locomotive shops

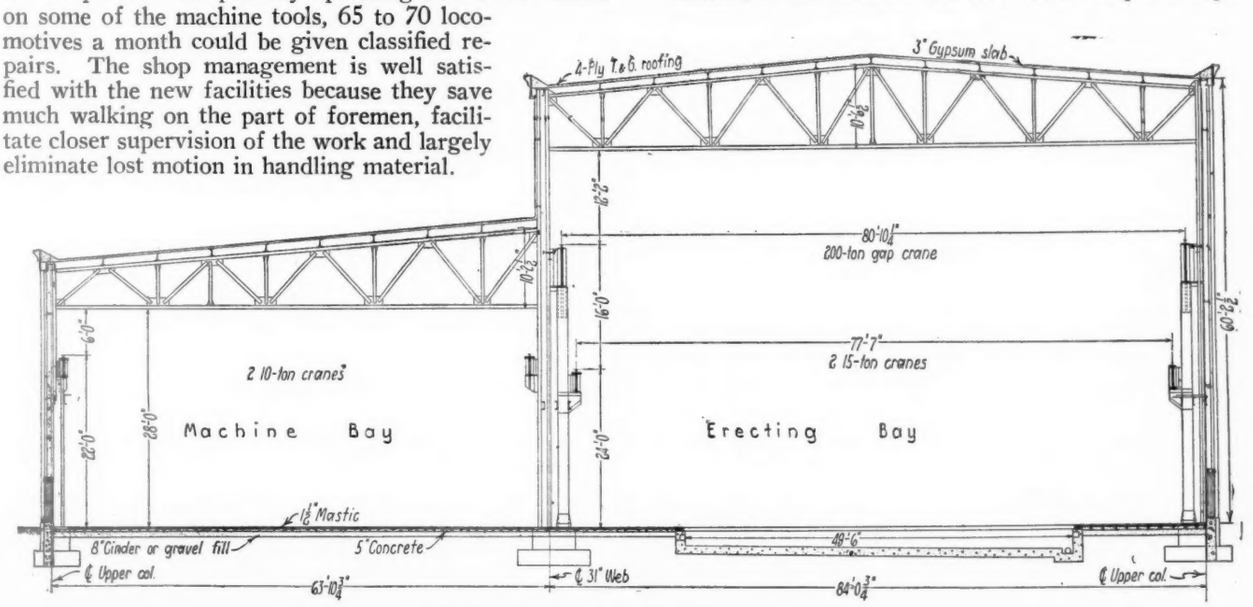
New and old facilities co-ordinated—Method of routing repair work through the plant carefully worked out

THE Wabash recently completed extensive improvements at its system shops at Decatur, Ill., which embodied the enlargement of the locomotive repair shop in accordance with a most unusual plan. It involved the addition of a new erecting shop of the transverse type to a plant which had been designed and operated as a longitudinal shop, yet this change was made with a minimum of alterations to the old structure. In fact, only 13 per cent of the original building was removed in effecting a net enlargement of 31 per cent in the ground floor area. Furthermore, the record shows that the alterations were carried on without any material reduction in shop output.

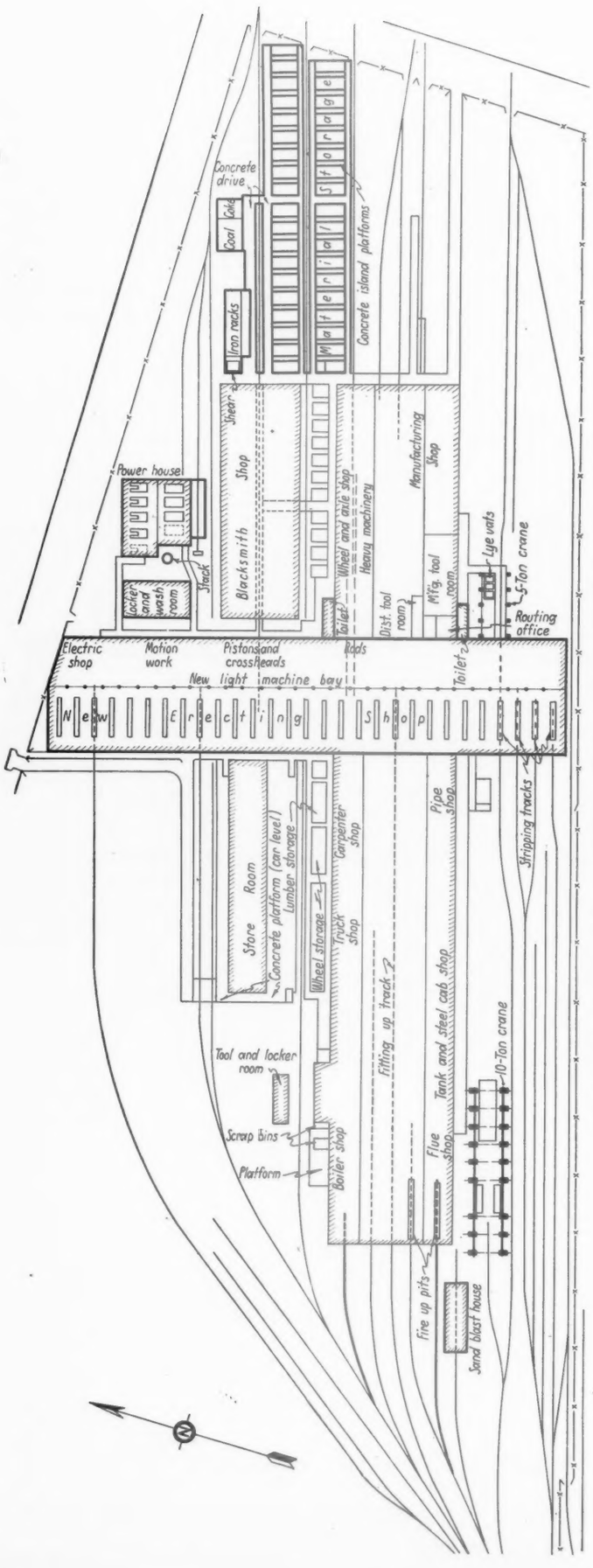
The new shop, an extensive improvement over facilities built only 14 years ago, was constructed with an eye to the future. The present output is about 40 classified repair locomotives a month but by adding to the shop force and possibly operating two 8-hour shifts on some of the machine tools, 65 to 70 locomotives a month could be given classified repairs. The shop management is well satisfied with the new facilities because they save much walking on the part of foremen, facilitate closer supervision of the work and largely eliminate lost motion in handling material.

The building of the old shop, which was placed in service in 1913, was the last step in a five-year program to replace the repair facilities at Fort Wayne, Ind., Springfield, Ill., and Moberly, Mo., by a centrally located system shop. It is 160 ft. wide by 1,118 ft. long with a central bay 80 ft. wide and 38 ft. high under the roof trusses that is served by two 75-ton traveling cranes. Flanking this central bay are two 40-ft. bays, that on the north side being used for heavy machinery and that on the south side for light machinery. The north bay was provided with two 10-ton traveling cranes. The central bay, which was formerly equipped with three longitudinal tracks was used for the greater part of its length as the locomotive erecting shop while its westerly end served as the erecting shop for the boiler and tank shop, the auxiliary facilities of which were concentrated in the side bays at that end of the building.

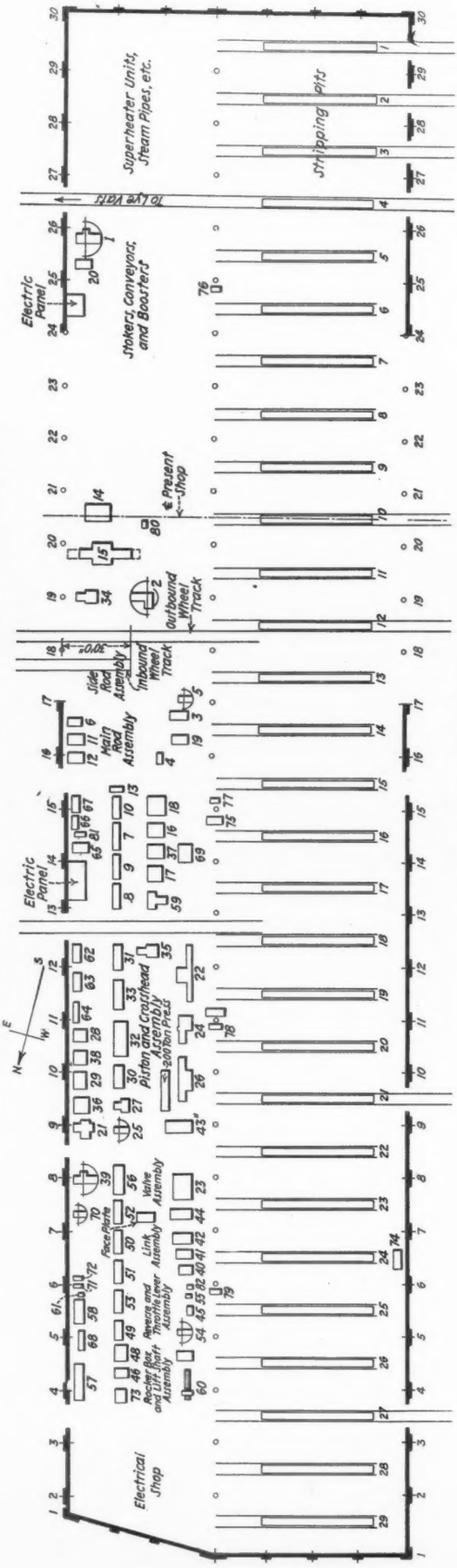
Located to the north of the locomotive shop and sepa-



Cross-section of the new locomotive shop



The locomotive repair plant at Decatur, showing the new facilities in heavy lines



Plan of the new erecting shop

rated from it by an alley 50 ft. wide is a blacksmith shop 100 ft. by 300 ft. and a storehouse 50 ft. by 300 ft. provided on both sides with car level platforms. A flue rattler and a flue storage shed is located south of the locomotive shop near its west end.

Study plans for enlargement

When the 1913 facilities became inadequate various schemes were considered for their enlargement. The idea of lengthening the building was abandoned because of the disadvantages of an excessively long locomotive shop of the longitudinal type. A plan for placing the boiler and tank work in a new separate structure and converting the old building into a transverse shop to be used exclusively for the repair of locomotives was also found impracticable because the limited headroom in the erecting bay precluded the lifting of locomotives over those standing on the pits. Another scheme considered was that of building a new erecting bay of the transverse type north of the present building and using the old central and south bays for heavy machinery but this would have involved the removal of the store building after only 4 years of use and would also have introduced certain operating disadvantages and an awkward arrangement of approach tracks.

The plan finally adopted differed radically from any of these. It embodied the construction of a new shop of the transverse type at right angles to the old one in a position between the ends of the store building and the boiler shop, and the removal of just enough of the old locomotive shop so that the new shop could cross through it to form a building in a shape of an unsymmetrical cross.

This new building is 673 ft. 11 in. long and consists of an erecting bay 85 ft. 2½ in. wide on the west side and a machine bay 64 ft. 9½ in. wide on the east side. It is divided into 29 tranverse bays 23 ft. 2 in. wide, each of which is occupied in the erecting shop by an engine pit. Pits 1, 2, 3, 4, 21 and 27 are connected with tracks leading out of the west side of the shop and in the case of Pit 4, the track is also continuous through the shop to a track leading out of the east side for the purpose of giving direct access to a battery of lye vats. In addition, Pit 10, which is located on the axis of the old erecting shop, is connected with the track leading down the center of the old erecting bay.

Some rearrangement necessary

While a considerable part of the old shop and the equipment it contained were not disturbed by this enlargement plan, it is obvious that some changes would be necessary when a section 150 ft. long was cut out of the middle of it. What this involves will be better understood with a general knowledge of the arrangement of the departments in the old shop. The occupancy of the north bay from east to west included the machine tools for wheel, axle, tire, cylinder and rod work; the engine truck and driver brake shop, and boiler shop. The south bay from east to west was occupied respectively by a general machine shop, motion work shop, distributing tool room, pipe shop, an air compressor room, paint and carpenter shop, tank shop and flue shop. A balcony over the east half of the south bay was devoted to brass and air brake work, a sheet metal shop and the office of the shop superintendent.

The portion of the old shop that was removed to make room for the new shop was occupied by the cylinder and rods departments in the north bay and by the tool room on the ground floor of the south bay, while the portion of the balcony which was removed was occupied by the offices and the manufacturing tool room.

The new machinery bay afforded ample space for the accommodation of all machinery displaced in the old shop, as well as for practically all other machine tools with the exception of those in the wheel shop, which was allowed to remain in substantially their original location at the east end of the north bay, and the general manufacturing and reclamation shop of the stores department which occupied the east end of the south bay. This rearrangement of tools made it possible to move the manufacturing tool room from the balcony to approximately the same location on the ground floor, which change in turn permitted the shop superintendent's office to be moved further east on the balcony. Space was also made for a cab shop in the north bay just west of the new shop. Further changes in the old shop in-

Interior of the new erecting shop

cluded the removal of all but the central tracks in the old erecting bay except for a length of the north track used by the boiler shop. In addition, the flue work of the boiler shop was moved east far enough to permit space for two firing-up tracks at the west end with connections to the yard.

Method of routing repair work

With this preliminary statement of the rearrangement of the shop facilities, the manner in which the use of the old and new portions of the shop have been coordinated in the repair of locomotives may be best understood by the following outline of the routing of engines through the shop.

The locomotives enter the shop over any one of the four tracks leading to Pits 1, 2, 3, and 4, which are used as stripping pits. The space in the side bay opposite these pits, which is not now occupied by machinery, is used for the storage of pipes, flues, headers, brakes and brake rigging, etc., as they are removed. Wheels are set out on the track in Bay 4 and are rolled out to the lye vats. After being cleaned they are rolled back and carried by crane to the wheel shop which they enter at its east end and move progressively westward toward the new shop as the work on them is being carried out.

If any extensive boiler work is necessary, the boiler is placed on a flat car spotted on one of the adjacent stripping tracks and transferred over one of the outside tracks to the boiler shop in the west end of the old building. After the locomotive has been stripped, it is transferred by crane to one of the erection pits and when the work has been completed, it is transferred by the crane to the track in Bay 10 whence it starts on a progressive movement westward over this track throughout the length of the western section of the old shop, during the course of which the finishing operations are completed. The first step is to apply the brake and brake rigging. Next with the engine opposite the pipe shop, all piping is applied, after which it is advanced to the cab shop to receive its cab. Then as it is moved opposite the tank shop, the tender is set behind it and attached and during the course of all of these operations, all painting of the locomotive is done. The locomotive is then ready for testing and firing up on one of the three testing-out pits provided at the west end of the old shop.

New shop of modern design

The new locomotive shop building conforms to current practice in structures of this class. It has a structural steel frame, supporting roof trusses and crane girders, the walls being entirely glass in Detroit Steel Product sash, with the exception of brick basewalls 5 ft. 7 in. high and narrow pilasters at the columns. The roof sheathing consists of three-inch precast Gypsum tile resting on purlins and covered with Bird & Son's four-ply asphalt roofing. The floor is five inches of concrete, covered with 1½ in. of Johns-Manville mastic. The erecting bay is 52 ft. 2 in. high to the underside of the roof truss and is equipped with two crane runways, one with the top of the rail 40 ft. above the floor for a 200-ton Whiting locomotive gap crane and the other with the top of the rail 24 ft. above the floor for two 15-ton Whiting messenger cranes. The machinery bay has a clear height of 28 ft. under the roof trusses and is equipped with two 10-ton Shaw cranes operating on a runway 22 ft. above the floor. The building is heated by Skinner unit heaters.

In the north end of the machinery bay, enclosed by wire netting partitions, is a small electric shop used for the repair of all electric equipment on the system. Small tool equipment occupies the portion of this bay immediately to the south of the electric shop, while the heavy machinery is concentrated to the north and south of a track leading into the machinery bay from the blacksmith shop.

Build new power plant

Another important unit of the improvement made at Decatur is a new power plant provided to house the electric operated air compressors which replaced those removed from the air compressor room in the south bay of the old locomotive shop, as well as boilers for heating and hot water supply. The boiler room is 86 ft. 2 in. long by 45 ft. 11 in. wide and contains three 350-hp. Heine water-tube boilers with space for one

Machine tools at the new Decatur locomotive shops (north end)

	Drawing location
One large radial drill press	1
Niles 6-ft. radial drill (motor)	2
Rod press (motor)	3
Disc grinder	4
36-in. Miller radial drill	5
16-in. Cincinnati shaper	6
18-in. Lehmann lathe (motor)	7
18-in. Lehmann lathe (motor)	8
18-in. Lehmann lathe (motor)	9
18-in. Prentice lathe	10
24-in. Cincinnati shaper	11
24-in. Cincinnati shaper	12
Wet grinder (motor)	13
Newton vertical mill	14
Slab miller (motor)	15
24-in. Bullard	16
24-in. Bullard	17
36-in. Bullard (motor)	18
Niles upright drill	19
Niles upright drill	20
52-in. Niles boring mill (motor)	21
Diamond guide grinder (motor)	22
26-in. Cincinnati shaper (motor)	23
Cleveland openside planer (motor)	24
36-in. Miller radial drill (motor)	25
Norton piston grinder (motor)	26
Ingersoll milling machine (motor)	27
36-in. Bullard (motor)	28
36-in. Bullard (motor)	29
18-in. Lehmann lathe (motor)	30
18-in. Lehmann lathe (motor)	31
27-in. Boye & Emmes lathe (motor)	32
24-in. lathe, Lehmann (motor)	33
18-in. slotter	34
18-in. slotter	35
36-in. Bullard	36
24-in. Bullard	37
36-in. Bullard	38
6-ft. radial drill	39
24-in. shaper	40
24-in. shaper	41
32-in. Ohio shaper	42
32-in. G. & E. shaper	43
32-in. G. & E. shaper	44
Disc grinder	45
Internal grinder	46
External grinder (motor)	47
External grinder (motor)	48
18-in. Lehmann lathe (motor)	49
18-in. Lehmann lathe (motor)	50
18-in. Lehmann lathe (motor)	51
18-in. Lehmann lathe (motor)	52
18-in. Lehman lathe (motor)	53
36-in. American radial drill (motor)	54
Wet grinder	55
24-in. Prentice lathe	56
Lift shaft lathe	57
LeBlond turret lathe	58
Knee type milling machine	59
Marvel power hacksaw	60
Wet grinder	61
16-in. Lehmann lathe	62
16-in. Lehmann lathe	63
12-in. bolt lathe	64
Niles upright drill	65
Nut facer	66
Nut facer	67
Centering machine	68
Tripple head bolt cutter	69
36-in. radial drill	70
Sensitive drill	71
Sensitive drill	72
Gisholt arc grinder	73
American portable lathe	74
American portable lathe	75
Norton rough grinder	76
Norton rough grinder	77
Norton rough grinder	78
Norton rough grinder	79
Grinder	80
Drill press	81
Press	82

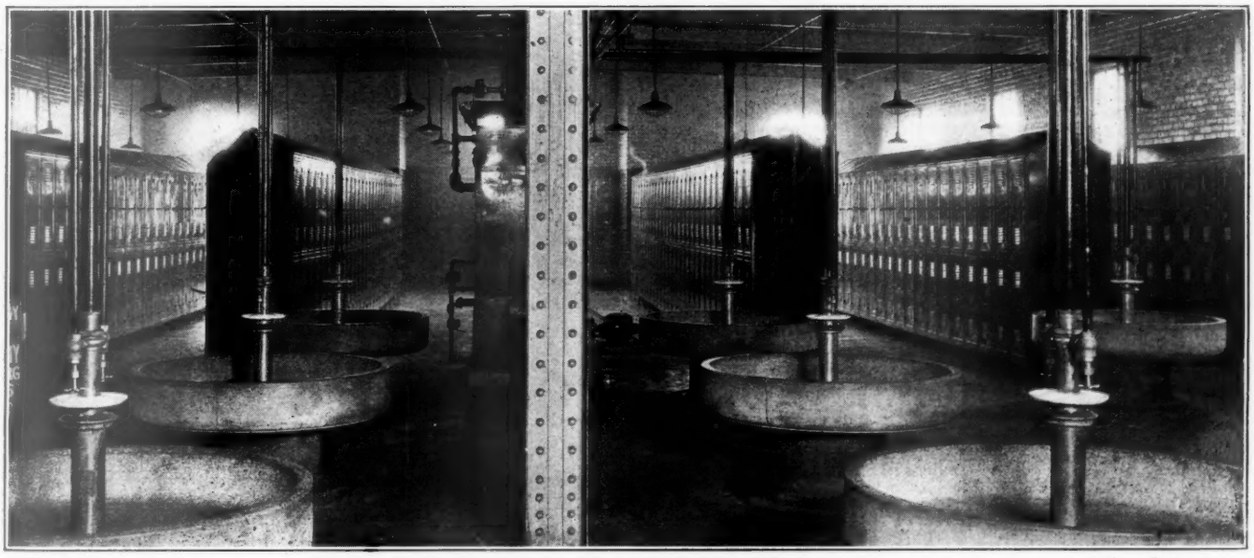
additional unit. The boilers are equipped with Cokal automatic stokers fed by hand. Ashes are removed by an American steam jet conveyor. The breaching leads to a radial brick chimney, 7 ft. in diameter inside by 175 ft. high. In the compressor room, which is 40 ft. wide by 100 ft. long, space has been provided for five electrically-operated air compressors, four of which have been installed. Three of these are Ingersoll-Rand two-stage compressors having a capacity of 1,000 cu. ft. of free air per minute, while the fourth is a Worthington air compressor having a capacity of 2,000 cu. ft. of free air per minute. All four are driven by General Electric synchronous motors operating on 440-volt, 60-cycle alternating current purchased from a local public utility company. The building has steel roof trusses supported on brick bearing walls with windows equipped with steel sash.

Another new unit is a sand blast house, a building 90 ft. long by 30 ft. wide with brick walls supporting steel roof trusses 20 ft. clear of the floor. Natural illumination is provided by four large steel sash windows on each side, the roof construction being the same as in the new locomotive shop. Three large ventilators are provided at the ridge of the roof. There is a door at each end 15 ft. wide by 17 ft. high to permit the entrance of cars on a track laid on the longitudinal center line. Artificial illumination is provided by 10 floodlights so placed as to give adequate lighting on all parts of a car spotted in the building. Compressed air outlets are provided with hose connections for portable sanding machines. A further improvement is a new 10-ton Shaw crane of 36 ft. 2½ in. span installed on a runway 210 ft. long erected over the flue rattler and flue storage shed.

Two other additions to the plant were made necessary as a direct consequence of constructing the addition to the locomotive shop. While this was placed in a position where it did not interfere with either the blacksmith shop or the storehouse, its construction did require the removal of a toilet building, 20 ft. by 60 ft., a fuel oil tank and a bar and miscellaneous iron and steel storage, occupying the area between the blacksmith shop and the storeroom. For this reason it was necessary to provide a new locker and lavatory building of brick construction one-story high, 45 ft. wide by 89 ft. long. It is equipped with 810 steel lockers and 12 large Bradley wash fountains. A material storage yard was provided east of the blacksmith shop with concrete roadways and concrete island platforms to facilitate delivery operations. There is also an iron shed designed for the systematic storage of bars and other iron and steel with a shear located at one end so that material can be cut to the exact lengths required before delivery. Five new underground tanks were installed in a line between the powerhouse and the blacksmith shop and provide storage for 26,000 gal. of oil.

A further improvement located at some distance from the locomotive shop is a new general office building for the motive power and car departments. This is a two-story and high basement reinforced concrete building of attractive appearance and thoroughly modern appointments. It houses the general offices, drafting room and testing laboratory of the department.

The improvements at Decatur were carried out under the supervision of R. H. Howard, chief engineer of the Wabash, in collaboration with the motive power department under the general supervision of G. F. Hess, general superintendent of motive power, the unique scheme for enlarging the locomotive shop having been developed by the motive power department. The improvements were carried out under contract by the Foundation Company, New York City, which also prepared all detailed designs for all the improvement work.



Well appointed locker and lavatory facilities

DIE HEADS.—The Geometric Tool Company, New Haven, Conn., describes in a 56-page catalogue the general or special construction of each style of Geometric die head of current manufacture that uses the Type D chaser. The tools shown in this book offer interchangeability for many types of machines.

GRINDERS AND BUFFING LATHES.—Many Bridgeport grinders and buffing lathes of belt and motor driven types are described and illustrated in a number of bulletins issued by the Bridgeport Safety Emery Wheel Company, Inc., Bridgeport, Conn. These bulletins are bound together in an attractive brown cover.

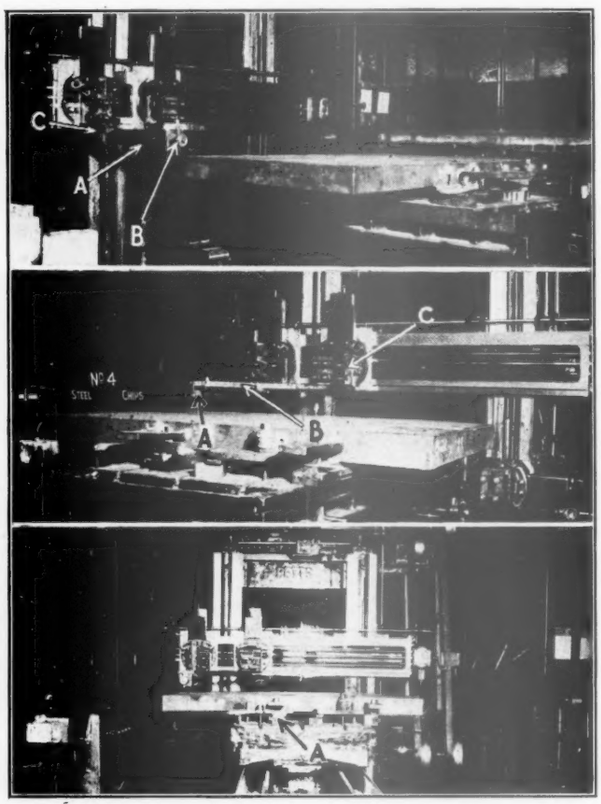
DIE HEADS.—The K line of die heads, which offer complete chaser interchangeability from one type of K head to another, thus permitting the stocking of only one type of chaser regardless of the type of threading machine used, is described and illustrated in a 32-page catalogue issued by the Geometric Tool Company, New Haven, Conn.

Method of planing a surface plate

By H. H. Henson
Machine shop foreman, Southern, Chattanooga, Tenn.

PLANING a large surface plate is one of the infrequent jobs in a railroad machine shop. It often happens that a planer with a bed large enough to properly hold the surface plate is not available. Such was the case recently in this shop, as it was necessary to plane a surface plate 6 ft. long by 47 in. wide, weighing two tons, on a planer with a table 42 in. by 42 in. by 18 ft.

The problem was solved by first clamping the surface plate to two, 2-in. by 5-in. by 6-ft. parallel strips and then clamping the whole to the planer table. As shown at *A* in the bottom view of the illustration, the parallel strip is placed 18 in. from the edge of the planer table to permit moving over the surface plate after the tool has reached the end of the cut, without changing the depth of the cut or altering the surface of the plate in any manner.

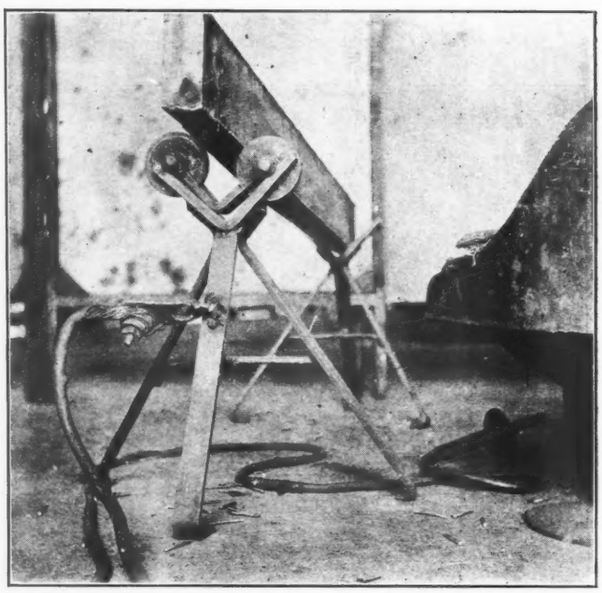


Top view—The arrangement of the overhanging tool post; Middle view—Method of bracing the tool post; Bottom view—The surface plate is placed across the planer bed to obtain the shortest length of cut to secure accuracy

A large overhanging tool post is fastened to the tool post clappers. The tool bar *A*, shown in the top view, is made of 3½-in. diameter carbon steel 50 in. long. A ¾-in. by ¾-in. by 3½-in. high speed steel tool bit *B* (top view) is held in place in the end of the tool bar by a ⅝-in. set screw. The tool bar is securely held in the split holder *C* (top view) by drawing the slot together with two ⅝-in. by 3-in. cap screws. Directly back of the tool bit is another split clamp as shown at *A* (middle view), to which is fastened one end of the support *B*. The other end is fastened to the clapper box *C* (middle view). This gives the overhanging tool the required rigidity to produce the finished and accurate job that is necessary for a surface plate.

Light steel trestles make welding easier

AT the Denver shops of the Denver & Salt Lake, the light steel trestles, shown in the illustration, were found a great help in welding long and heavy material, such as journals and crosshead guides which are difficult to turn when making a circumferential weld. The trestles are made of three 18-in. sections of ½-in. by 1½-in. steel, with the top ends turned outward and the bottom ends turned inward. The three pieces are welded together to form a tripod. A 20-in. section of 1-in. square steel bent to a vee-shape, is welded into the top of the legs. The trestles are used in this form for flat material unless it is desired to weld journals or other round material, when two pairs of 3-in. rollers each held in a vee-shaped frame, are dropped into the top of the frames. The ground wire from the welding machine is attached to one of the trestle legs. The legs of the trestles are stiffened by a brace.



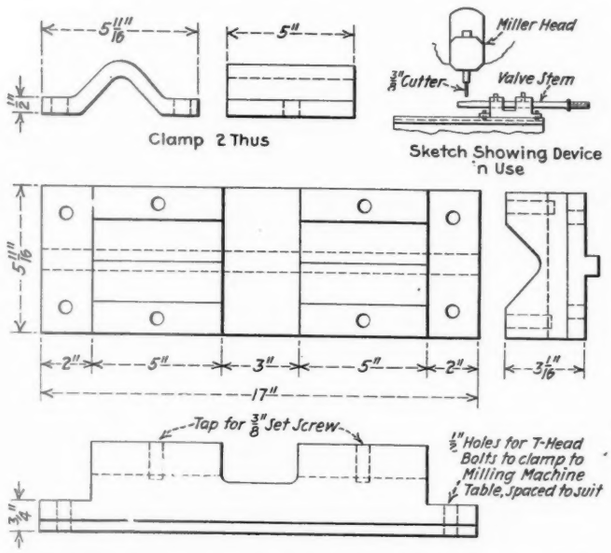
Two steel trestles used for welding long, flat or circular material

Device for milling valve stem keyways

THE device shown in the sketch consists of a block, on the bottom of which is a tongue made to fit the bolt slot in the table of a milling machine. This device was developed and is used in the Lehigh Valley shops at Sayre, Pa. Two vee-shaped grooves are cut in the top of the block in which the valve stem is clamped. The block is made so that it parallels the valve

stem with the milling machine table feed. The keyway in the valve stem is cut by moving the milling machine table backward and forward and feeding the cutter down into the work.

This device is easily set up owing to the fact that the clamping of the job to the table lines the work up. With the old method the keyway was laid out on both sides of the rod and the rod was drilled first on one side and



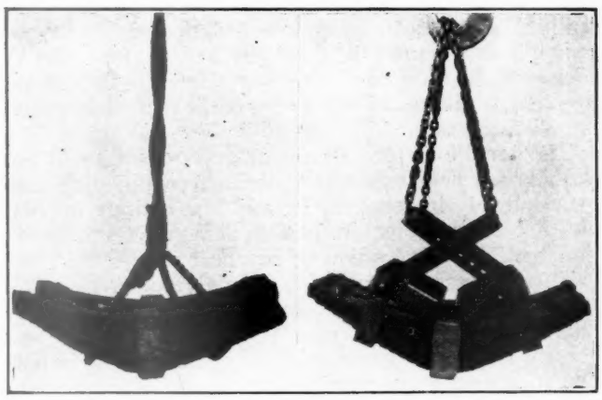
Use of this device for milling keyways in valve stems makes it possible to do a complete job in one operation

then on the other. As much metal as possible was removed in this way by drilling the holes close together. Upon completion of this job, the rod was then clamped in a vice, the remaining metal chipped out and the keyway filled to size.

The new method produces a fine job when compared with the old method, and considerable time is saved, as all of the work is performed in one operation.

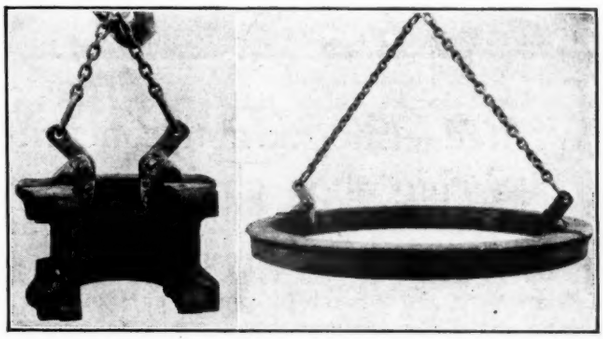
Safety crane devices for the locomotive shop

A DEFECTIVE crane hook or sling is always an accident risk. So also is crane lifting equipment which is used to lift material for which it is unsuited. The



The device for lifting springs, shown at the right is much safer than the rope sling at the left

device shown in one of the illustrations for lifting springs is a big improvement over the old rope sling method. It not only assures a safe means of transportation, but it is also a time saver because it can be adjusted and applied to the springs in much shorter time than the rope sling. Metal slings of the same design as shown



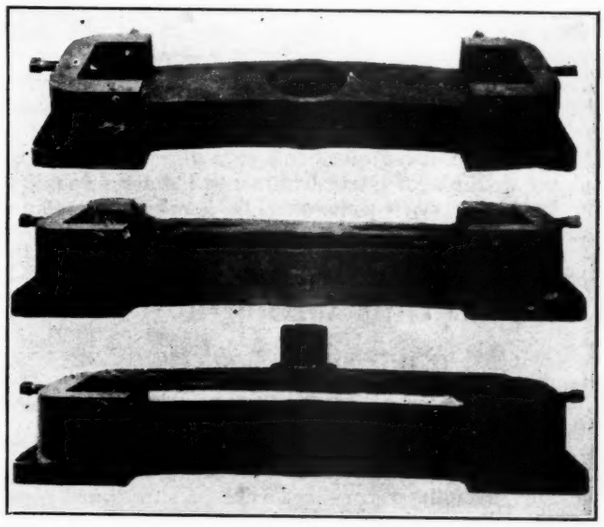
Hooks of similar design used for lifting driving wheel tires and locomotive journal boxes

can be made for lifting a larger number of springs than are shown in the illustration.

The hooks, also illustrated, are a design used in many railroad shops. These hooks were made special for driving wheel tires and driving boxes.

Jig for machining Walschaert valve links

SHOWN in the illustration is a jig for machining Walschaert valve links on a shaper. The jig is of cast steel finished on the top and inside faces. The link



Top—Jig for holding the link; Center—Ready to machine the inside; Bottom—Link in position to machine the outside

is held in place by means of three set screws. The hole in the center of the jig is countersunk and the trunnion fits inside during the operation of machining the inside face of the link.

The Reader's Page

Have You a Question? Ask it
Have You an Opinion? Express it

Wanted—Information concerning shop chains

CHICAGO, Ill.

TO THE EDITOR:

Can the readers of your magazine furnish any information on the subject of proper or standardized methods of testing and inspecting locomotive shop lifting chains and cables? Some chains are only used approximately once a week, others several times a day, hence a regular time limit for all chains is not desirable.

Some, I find, say they normalize them every month. How is this done? At what temperature? Who, in the organization, is responsible for seeing that the chains are normalized when they are being used in various departments under different foremen? After normalizing, what then? Who inspects them and how is it done? If one or more links are found checked, what is done about it? Is the whole chain scrapped or links renewed and who decides what to do about condition found?

What system is best to ensure that a chain is not overloaded? What is done regarding chain hoists? Are these chains ever normalized or heat treated or annealed, or whatever the process is called? What is the difference, anyway, in these processes as I am advised that in different shops, each of these various methods are followed. Which proves to be the best?

What is the rule regarding cables on lifting cranes? Does length of service have any bearing on the problem? If, on inspection one or more wires or strands are found broken, what is done about it? How many wires may be broken and the cable still remain in service? Who makes the inspection and what instructions does he work under and how often is it found best to inspect them?

Answers to these questions or a discussion on this subject would be of interest to many who are responsible for keeping down accidents while keeping costs down as well.

"SAFETY FIRST."

Substituting wrought iron for cast steel yokes

NEW HAVEN, Conn.

TO THE EDITOR:

The following question was asked in the May issue of the *Railway Mechanical Engineer*. Can an A. R. A. standard wrought iron riveted yoke be substituted for a cast steel key-way yoke? Is it wrong repairs to make such a substitution?

There has been considerable discussion on this question, and comments have been published every month since the question first appeared. In this discussion the original question has not been interpreted correctly.

In the October issue, page 635, in an editorial on the A. R. A. interchange rules, you state that "A discussion has been going on as to whether substituting cast steel yokes for wrought iron constitutes wrong repairs." This part of your editorial should read vice versa. If you will refer to Mr. Orr's comment in the same issue you will readily see that he has interpreted this question in the same manner that you have quoted in your editorial.

I am assuming that the reader who asked the question meant cast steel key-yokes and not cast iron. This question is now answered quite clearly in the A. R. A. Supplement No. 1 to the 1927 Code of Interchange Rules. (See Rule 17, Interpretation 23.)

At the time that this question was asked it was not considered wrong repairs to make such a substitution. Rule 17 states that A. R. A. standards may be substituted for non-A. R. A. standards, providing such substitution does not impair the strength of the car. However since this question was asked the Arbitration Committee has ruled that such a substitution does impair the strength of the car, and that a defect card should be issued for labor only in cases of owner's responsibility. The committee therefore rules that such a substitution impairs the original construction of the car. In view of the fact that the A. R. A. has recognized the key-way yoke for new equipment, with no alternative method, it should be protected.

JAMES MCDONNELL.

Draft gear maintenance

ST. LOUIS, MO.

TO THE EDITOR:

I have read the editorial, "What about draft gears?" in the November *Railway Mechanical Engineer*, and am pleased to find that the subject of draft gear maintenance is receiving attention. The need of an energetic thoughtfully directed campaign on this phase of equipment maintenance is everywhere evident.

There are many difficulties to be met and overcome in this work. That of greatest concern and proportion is the innumerable draft gears applied in past years without first definitely determining the serviceability of the particular type. There is evidence on every hand of the promiscuous experimentation in draft gear building. This condition, as you know, is now receiving expert attention, which will bring about improved draft gear building on equipment that will be put into service. However, as suggested by your editorial, the greater problem is the necessary improvement in maintenance of existing gears.

The conditions recited present great obstacles to prescribing any definite instructions for reconditioning those gears already in service. It would be entirely impossible, at present, to require periodical removal and inspection with any expectation of practical results.

There is very evident need, from an economical standpoint, of better inspection and maintenance of this appliance. I agree with your editorial that it has been grossly neglected; however, I do not favor the imposition of a mandatory requirement for periodical removal and inspection until there is more information available as to just how and when this work should be done.

Nevertheless, I do strongly favor the institution of a

concerted campaign on this work and the collection of all useful information for the benefit of all concerned.

I am convinced that we can educate our car men to recognize faulty draft gear conditions as readily as any other. Further, when we are in a position to say just what is wanted they will get it done in a practical way.

The condemnation of draft gear parts must not be left entirely to judgment. Gages for determining the limit of serviceability and prescribed limits of wear must be provided for the parts of the numerous gear types.

We are now at work on this problem but do not feel that we have arrived at a solution. However, we have developed some very valuable information and I am encouraged to believe that within reasonable time we shall have a workable result-producing practice.

S. O. TAYLOR
Master car builder, Missouri Pacific.

The relation of impact to truck construction

CHICAGO.

TO THE EDITOR:

The questions propounded by Clayton F. Crosson of Berlin, Conn., printed in the October, 1927, issue of the *Railway Mechanical Engineer*, page 690, are of vital interest and deserve the utmost consideration. A thorough investigation should be made as to whether a rigid truck of the cast steel side frame type or of the flexible arch bar type is the most suitable for present day service.

While his two questions are distinctly different, yet as a whole, impact affects both and impact is entirely disregarded in specifications and tests for side frames. To analyze this properly we must go back to the wooden underframe car, which had more flexibility than the all-steel rigid car bodies and modern draft gears combined. They did absorb the shocks that were transmitted to them as well as to the trucks.

When the cast steel side frames were placed in service their strength was based on the strength of the arch bar trucks of the same capacity, but after a few years they began to fail and the cast steel sections were changed and the weights increased. Then steel underframe cars came into use and arch bar trucks began to fail. Arch bars would break in the bends, truck columns followed, box bolts sheared, truck springs were knocked out and scattered all over the right of way. All of this occurred without any change in the original capacity of the cars.

Then came the increase of axle capacity, 1,000 lb. each on the 40-ton, and 2,000 lb. each on the 50-ton, or a total increase of 4,000 lb. in the 40-ton and 8,000 lb. in the 50-ton cars. Compare these figures with strengths of side frames tested by the Committee on Car Construction as shown in Circular DV-522, and it would not be a drop in the bucket, insofar as carrying capacity is concerned. Therefore, it can plainly be seen that it isn't the increased maximum axle capacity that produces stresses that cause failure, but the unknown forces of impact that set up high stresses at rigid points which cannot be measured or calculated.

Cast steel side frames never will equal rolled steel sections when used under continuous vibration, because cast steel is subject to foundry conditions from which rolled sections are free.

It is true that the A. R. A. arch bar truck is hard to maintain in its present form, and the increased sections recommended by the Committee on Car Construction will not greatly improve the conditions, because the weakest spots in the old A. R. A. arch bars have not been eliminated; these are the bends in the lower arch bar at the lower corners of the column castings and at the upper corners of the journal boxes, which straighten and fail under impact. The column bolts have not been changed; these should and can be entirely eliminated in rebuilt arch bar trucks.

The lower portion of column castings should have no rigid connection to the lower arch bar. The lower arch bar should carry the load, but be free from longitudinal impact; placing double duty on this member is the direct cause of many failures. By connecting the lower ends of the column castings to the tie bars, impact is transferred to the lower part of the journal boxes which will flex and avoid the hammer blow effects on the inverted arch bars.

H. C. PRIEBE.

Applying the A. R. A. interchange rules

GREENVILLE, PA.

TO THE EDITOR:

I see in the November, 1927, issue that Mr. Searles has submitted a further explanation on the yoke question. The argument first began, as I recall it, over the question, "Does the substitution of a wrought iron A.R.A. standard yoke in place of a cast steel yoke constitute wrong repairs?". The abstract of the proceedings of the Railway Car Department officers' Association, published on page 723 of the November issue, makes it fairly clear where the discussion must have originated. It is not the first time that that organization has issued answers to questions which caused confusion in an already complicated field.

Mr. Searles now asks whether a wrought iron yoke can be used to replace a cast steel yoke on a Type D, 6-in. by 8-in. shank coupler. The changes in the condition of the problem are significant for there is no wrought iron A.R.A. standard yoke for a 6-in. by 8-in. butt coupler. Therefore, no A.R.A. standard yoke for a 6-in. by 8-in. coupler exists. Rule 88 provides for the substitution of any yoke that does not weaken the car.

But there is the further fact that paragraph (c) of Rule 17 provides that "dimensions of shank and butt of A.R.A. couplers standard to the car must be maintained." Again, as there is no A.R.A. standard riveted butt coupler, 6 in. by 8 in., to substitute a coupler with a head similar to a Type D head but with a riveted butt, is a violation of paragraph (c), without going into the question of whether it weakens the car or not.

As a matter of fact, any man who is familiar with break-in-twos due to draft key coupler failures in their various forms, could perhaps put up a pretty strong argument that riveted couplers are a considerable improvement over key couplers. But that has nothing to do with the case.

From Mr. Searles' parting thought that one can scarcely apply any rule literally, there are many reasons for dissenting.

We would all be better off if the Mechanical Division, A.R.A. billing offices of the various roads and the Arbitration Committee would strictly adhere in minute detail to every rule which is clear in its meaning, leaving questions of policy to be argued in the convention and then changed in the annual revision of the rules.

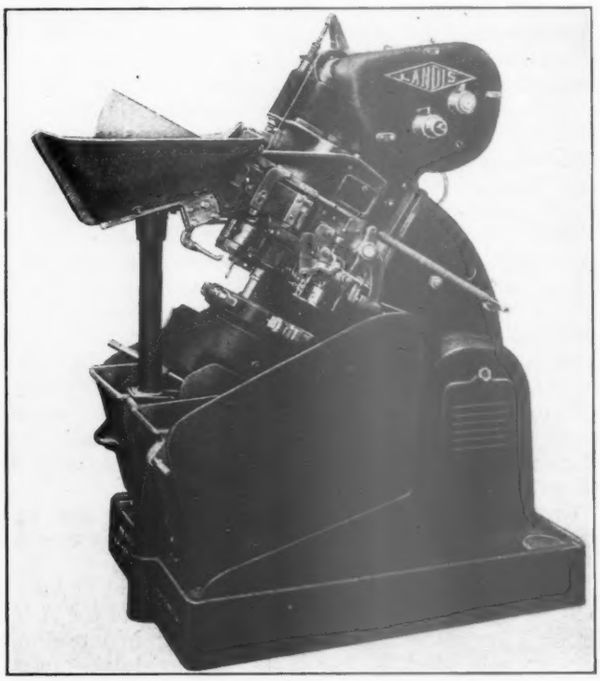
As it is, on a good many questions, we are like party candidates at a primary who are defeated and then run independent. There may be individual profit in a single case. But, as a general policy over a period of years, a strict adherence to the letter of the law (if it can be determined) seems the policy most likely to clear up the confusion.

A. M. ORR.

Automatic pointing and threading machine

THE Landis Machine Company, Waynesboro, Pa., has placed on the market a machine designated as the Landis automatic pointing and threading machine that will accurately and rapidly produce bolts cut to length, pointed and threaded. The machine has a range from 5/16 in. to ¾ in. for diameters, 1 in. to 6 in. for lengths of bolts, under the head, and will cut a thread 2½ in. long.

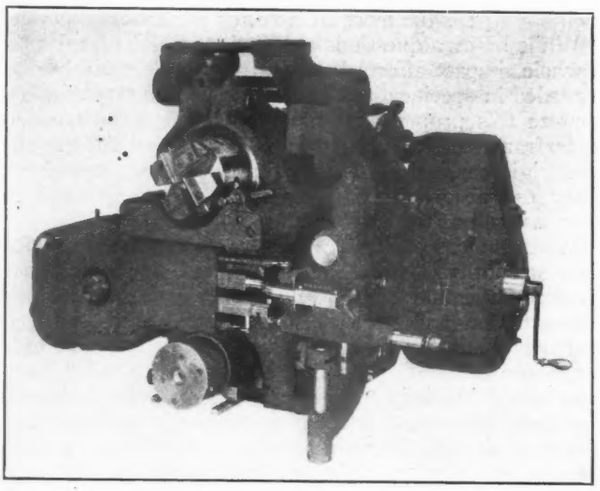
New features are employed which insure a full thread at the start, a more accurate lead and a minimum amount



The Landis automatic forming and threading machine

of taper. These features automatically duplicate the movements of a good operator on a hand operated threading machine. The machine employs a special ¾-in. Landex-head which is a revolving head of the pull-off type. Landis chaser are used in the head.

The time element for the return of the forming and threading heads and the indexing of the turret chuck is constant, regardless of the diameter, pitch, length of thread, quality of material, or the threading speed. The instant that the forming and threading operations are completed, an automatic accelerated motion, entirely in-



The forming and threading spindles are mounted on Timken roller bearings

dependent of the cutting speeds, withdraws the forming and threading spindles and indexes the turret. The constant time element also permits maximum speed for the smaller diameters of screws and for the shortest thread without endangering, in any way, the operating mechanism.

The turret chuck has three stations, one for unloading and loading the work, one for cutting to length and forming the end of the screws and one for threading. These operations are performed simultaneously. An ejector is provided at the unloading and loading station which will eject the bolt should it fail to drop from the grips.

The chuck jaws open and close on a pivot which is parallel to the bolt. This centralizes and squares the bolt regardless of any variation in size and insures concentricity of the thread with the body of the bolt. This feature also permits of the gripping of long bolts close

to the part to be threaded without any sacrifice in the effective gripping pressure. Grips for gripping all bolts which the industry is called on to make can be supplied with the machine.

It is easily and quickly adjusted for the various diameters, lengths of threads and lengths of bolts. It can be changed for length of thread and length of bolt in ten minutes. The time required for a complete change of diameter, pitch length of thread and the length of bolt is approximately 55 min. One set of cams covers the entire range of the machine. No retiming or adjustment of cams is necessary.

The speed of the threading head is quickly changed by change gears. The time required for this change is approximately two minutes. Any change in the speed of the threading head effects a corresponding change in the speed of the forming head, but not in the speed of the indexing mechanism, which is constant.

Automatic safety devices which require no attention make it impossible for the machine or any of its units to be damaged by any obstacle or obstruction. These safety devices are so placed that the machine functions without any retiming or adjustment after the obstacle or obstruction has been removed. Expensive set ups and delays are thus avoided.

The threading head is located at the front of the machine in full view of the operator. It is screwed to the nose of the spindle which has a coarse pitch thread. This head is quickly removed without dismounting the yoke. The forming head is likewise accessible when the turret chuck is in a lowered position. A clamping screw and a backing up screw only are removed to replace the pointing tool. This operation will not consume more than five minutes. A pointer is provided for relocating the turret chuck.

The machine is hopper-fed. Bolt or screw blanks are shoveled by hand or dumped from a traveling bucket into the hopper and delivered to the transfer fingers through a magazine leading from the hopper. The transfer fingers transfer the bolts to the grips in the turret chuck. The length of the finished bolt is controlled by an adjustment of the transfer bracket which is graduated for the various bolt lengths. An escapement is required for certain types of bolts. This attachment is incorporated in the front plate of the magazine and can be applied to the machine at any time.

The forming and threading spindles are mounted on Timken roller bearings. They are fully enclosed as a protection against chips and dirt.

The threading unit is counterbalanced. By this means the advance of the die head on the bolt during the threading operation is uniform and is under control at all times. This insures threads that are correct in lead. The chasers are flooded by two streams of coolant delivered through the threading spindle and through a nozzle located at the front of the head. The forming tool receives the coolant through the forming spindle.

The finished bolts and chips are collected in separate compartments which are set on an angle so that the bolts and chips can be dumped into containers. The doors, when lowered, form chutes to the containers.

The machine is furnished either belt or motor drive. When belt driven, a single pulley drive is employed. When motor driven, the motor is mounted in the base of the machine and the power is transmitted to the main driving shaft by a belt.

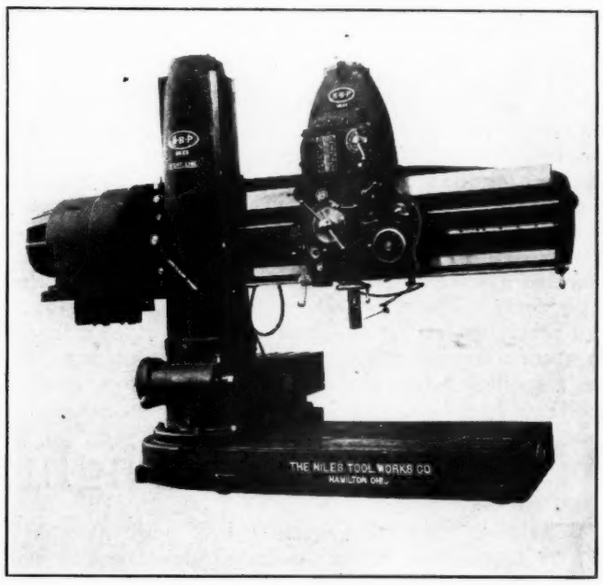
Niles heavy duty Right Line radial drill

TO supplement the No. 10 medium pattern Right Line radial drill, the Niles Tool Works Company, a division of the Niles-Bement-Pond Company, Hamilton, Ohio, has placed on the market a heavy duty radial drill which is designated as the No. 25 Right Line. Although retaining some of the characteristics of the No. 10 machine, the new drill embodies many changes over the lighter type.

The machine is of the plain radial type driven by a direct current variable speed motor. The drilling radius is 6 ft., but it is also planned to build the machine in 7-ft. and 8-ft. arm lengths. The machine is driven by a 20-hp. motor mounted on the end of the arm behind the column and is connected to the arm shaft by a flexible coupling, the arm shaft coming directly to the head through the divided column and the center of the arm.

All speed changes are embodied in the head itself. These changes are obtained through selective sliding gears of the automotive type shifted by ball socket levers. The spindle drive, including the arm shaft, is mounted on ball and roller bearings and the sliding gears on multiple spline shafts with integral keys. There is 100 to 1 speed range, the minimum being 12 r.p.m., the maximum 1,200 r.p.m. In the d.c. variable speed drive machine, this range is effected by three mechanical changes of speed, shifted by one lever, combined with the variation of the motor speed. In the a.c. constant speed drive, there are 24 spindle speeds, all obtained mechanically through the movement of three levers. Reverse for tapping and other operations is effected by reversing the motor, friction clutches for this purpose being entirely eliminated.

The final drive to the spindle is through a double set of worm gearing of special tooth form mounted at the lower end of the spindle. The smaller worm wheel



A front view of the Niles No. 25 Right Line radial drilling machine

takes care of the higher speeds (300 to 1,200 r.p.m.), the larger one being an engagement for speeds from 12

to 300 r.p.m. These worm wheels are mounted on a sleeve on the spindle. The high speed worm wheel is engaged by a jaw clutch on the arm shaft sleeve and the low speed worm wheel by a jaw clutch on the spindle. For the high speed ratios on the d.c. machine there is but one worm wheel contact between the motor and spindle. The a.c. machine has two spur gears and one worm wheel contact for the same ratios. Low speed ratios on the d.c. machine go through two spur gears and one worm wheel contacts and the a.c. through four spur gears and one worm wheel contacts from the motor to the spindle. There are 16 feeds available.

The head is totally enclosed in an oil-tight and dust proof case and the gears and shafts lubricated thoroughly by a pump mounted inside the head and geared to the arm shaft. The worm gears are lubricated by pressure through two nozzles, the jets impinging directly onto the teeth contacts. Other gears and bearings are lubricated by gravity lines from a reservoir in the top of the head. The spindle is oiled separately through a sight feed oiler on top of the head. The spindle is 3⅞ in. in diameter at the driving point and is bored for a No. 6 Morse taper.

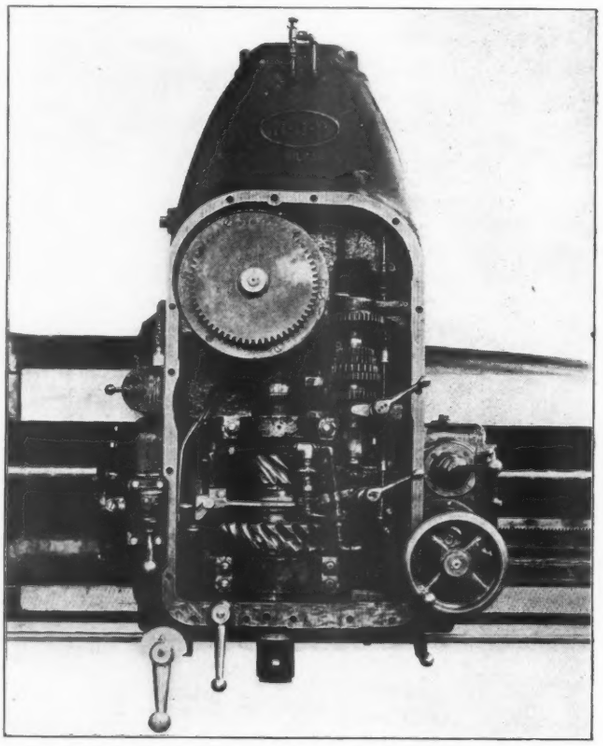
Power feed is engaged by two levers operating jaw clutches. These levers also serve to traverse the spindle by hand. A large graduated dial is provided with levers and stops, so that the feed may be tripped at the desired depth. The trips are also furnished to disconnect the feed mechanism at either end of the spindle travel.

The head is moved along the arm either by hand or by power. The power traverse is obtained through a worm gear connection from the arm shaft to the reversing frictions on the rack pinion shaft. The hand wheel is connected to the rack pinion shaft by spur gears and a jaw clutch. This clutch is interlocked with and shifted by the power friction clutch lever, so that when the frictions are in neutral, the jaw clutch is engaged, or the hand wheel is disengaged when the head is traversed by power. The rate of power traverse is 25 ft. per min.

The head is supported on the arm on two adjustable ball bearing rollers sustaining the weight of the head on the top of the upper arm way. The upper way is square locked by an adjustable taper gib, the lower way by a retainer plate, with provision for a hand clamp to lock the head to the arm.

The arm is of patented design with the lower bearing surface set back to give increased tortional strength to the arm. It is supported and slides on columns on four vee ways. A single lever serves the dual purpose of elevating or lowering the arm and clamping to the column and is so arranged that when the arm is clamped, none of the elevating gears are in motion. Power for raising or lowering the arm is taken from the sliding gears on a worm shaft meshing with a gear on the arm shaft sleeve. The worm wheel runs in oil and is geared to a revolving nut on an elevating screw which is hung on a cone friction spool at the top of the column and has a toothed collar pinned to it near the top, so that when the arm reaches its highest position, the nut will engage the tooth collar and revolve the screw, thus stopping further movement of the arm. Upon striking an obstruction in a downward direction, the screw will be lifted off its seat. The arm clamp is operated by a nut and screw through an equalizing bar with a double leverage. The rate of the arm elevating traverse is 35 in. per min.

The main body of the column is divided into two box form sections. The connection between column and pedestal is through large roller bearings and an adjustable split tapered bushing at the bottom end. A balance spring is mounted inside the column adjustable from between the column ways and made to support the weight of the machine when unclamped on a ball thrust bearing. The clamp consists of two half rings, hinged at one side and contracted by a nut and screw on the other side. These half rings are tapered on the bottom side and wedge themselves between a flange on the pedestal and a solid ring fastened to the column. Thus, the column is forced down against the top surface of the pedestal. The clamp is operated by a ¼-hp. motor through worm gearing. The motor is controlled by a switch on the head. Provision is also made to clamp by a hand lever.



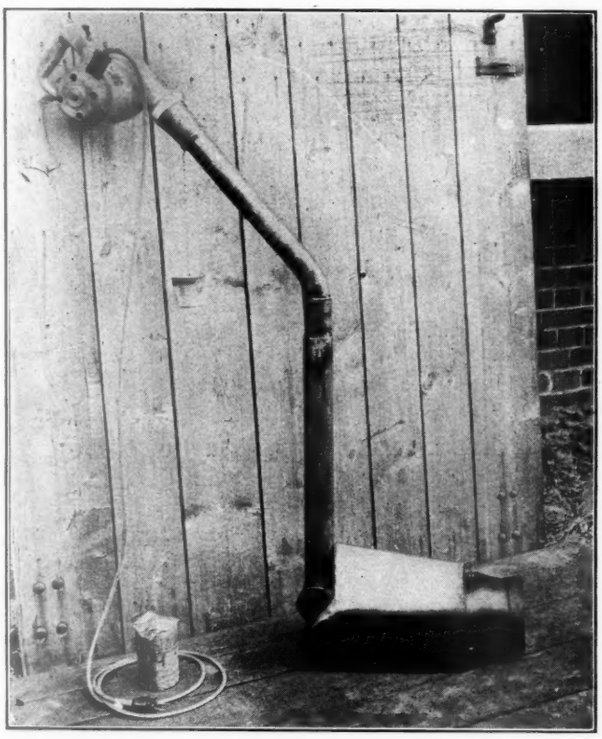
An interior view of the head

A device for lighting locomotive fires

THE lighting of locomotive fires with oil soaked shavings or waste has its disadvantages in that the labor charges are high and that there is a constant fire hazard if not housed in a fireproof building. In addition, the prepared shavings must be hauled to the locomotive and when used give off considerable soot that has a tendency to cling to the flues.

With the new apparatus, which has been patented and used extensively in Germany and introduced into this country by William G. Kohler, 2270 Broadway, New York, these drawbacks have been overcome, not by placing the shavings or waste, as has been done heretofore, into the firebox and lighting them there, but by burning a chemical cartridge by a special device in which a sufficient quantity of air is supplied to the fire lighter in such a manner that the formation of soot is prevented and

complete combustion takes place. The device is constructed to be portable and of such a shape as to be easily introduced through the fire door into the fire box. The formation of soot is prevented by air being blown through nozzles against the front surface of the fire lighter, which is placed in a sort of combustion chamber. The smoke produced during the combustion is forced back into the combustion chamber and is completely burned. Provision is also made to consume the soot completely by entirely enveloping the fire lighter with air



The locomotive fire lighting device with an electric air blower attached—A cartridge is shown at the left

or by repeatedly introducing air at points in or at the outlet of the combustion chamber. The intensive flame produced in the manner referred to suffices for igniting any kind of coal.

The air is supplied through a movable pipe connected pivotally to the combustion chamber, or through flexible metal tubing, which enables the combustion chamber to be placed at any suitable point over the grate. The stream of air may be taken from the shop air line or may be supplied by an electrically driven blower attached at the end of the handle, as shown in the illustration.

The cartridge is made of 10 per cent shaving and 90 per cent napthalin or anthrazes, chemicals which produces a flame three feet long that has an average temperature of 1,900 deg. F. This cartridge, which is placed in the combustion chamber, burns for five minutes.

The outer casing is made in the shape of a roof for protecting the combustion chamber, when coal is thrown on the fire while the apparatus is in action. This form of outer casing also facilitates the withdrawal of the apparatus from the heap of coal. In the tunnel formed in this manner the big jet-shaped flame or the air from the fan can be particularly effective. After the cartridge has been consumed, the air is free to pass through the combustion chamber and acts as an additional stream of air to assist in burning the ignited coal.

The application of the apparatus is briefly as follows:

The flame, which is three feet in length, burns for five minutes

Coal is thrown in the middle of the grate before the tube sheet. The cartridge is placed in the combustion chamber of the lighter and ignited with a match. The apparatus is then placed before the heap of coal and is completely covered with coal. As soon as the blower is in action, an intensive flame is developed, which ignites the coal within a few minutes, whereupon the apparatus is drawn slowly out of the heap of coal, leaving a tunnel behind in which the flame meets a large combustible surface. After about five minutes, the cartridge is completely consumed and now the apparatus acts as a blower only. As soon as the heap of coal is burning thoroughly, the apparatus is removed, the burning coal scattered over the whole grate and the fire then treated as usual.

The apparatus has achieved success in Germany. Up to the present time only the German State Railways have been supplied in Germany. The management of the railway at Frankfort-on-the-Main, where the apparatus has been in service over a year, calculates the saving at about 48 per cent in the cost of firing up.

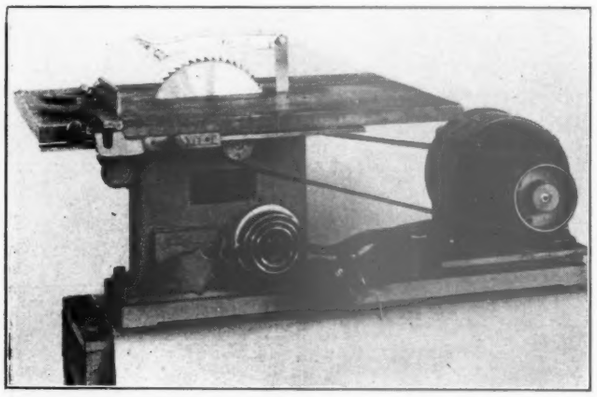
Bench saw fully equipped with ball bearings

A WOODWORKER'S precision bench saw fully equipped with ball bearings has been placed on the market by the American Saw Mill Machinery Company, Hackettstown, N. J. The machine is provided with a solid cast table, 18 in. by 24 in., which tilts to any angle up to 45 deg., operated by a convenient hand wheel at the side of the pedestal. The saw is raised and lowered by another hand wheel which is also located at the side of the pedestal. The tilting device operates through a worm gear and quadrant, both having cut teeth. The raising and lowering device operates through bevel gears and a screw which provides accurate setting to regulate the depth in grooving or rabbetting work. The table has a rise and fall of 2¼ in., the saw projecting through the table 2¼ in. at its highest point. The saw furnished is a combination rip and cut-off saw, 8 in. in diameter.

The table is provided with a combination rip and cut-off gage. When used as a cut-off gage the slide head is released and the gage moves on the table, being guided

by a steel bar to which the slide head is firmly gibbed.

The fence may be set at zero for square work or at any angle desired for mitre work, the quadrant being provided with degree graduations. The ripping gage opens 9½ in. from the saw and a graduated bar indicates the distance from the saw. When the cut-off gage is drawn back to its extreme position the distance from the face of the fence to the edge of the saw is 7 in. An aluminum guard and steel splitter are furnished with each machine.



A motor driven ball bearing bench saw

The mandrel runs in ball bearings. It takes saws with ¾-in. holes and there is sufficient space between the collars to admit grooving or dado heads ⅝ in. thick.

The machine proper is attached to a sub-base which also carries the electric motor. The motor is mounted on rails having considerable adjustment for belt length. It is also provided with a screw adjustment for belt tension. This machine may be furnished without the sub-base and may be driven from any conveniently located motor or from an underneath countershaft.

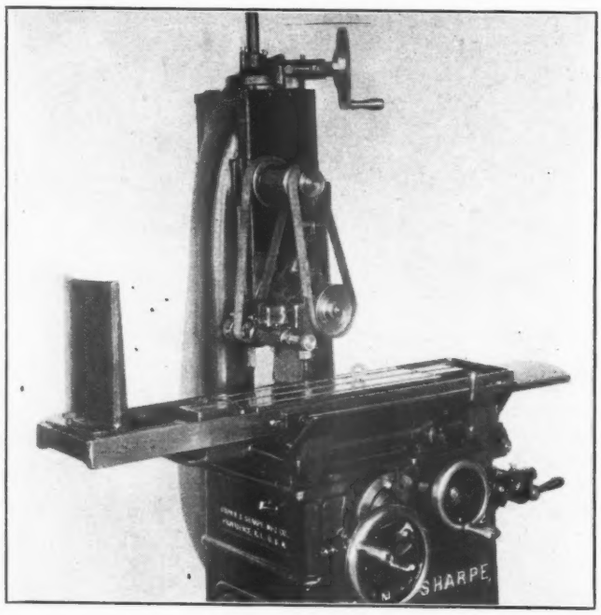
The motor regularly furnished is ½ hp. single phase, 110-220 volts for 60-cycle current, to operate from a standard light socket. A starting switch, cord and plug are furnished for that purpose. A three-phase 220-volt, or 110-volt, 60-cycle motor can be furnished when desired.

High speed surface grinding attachment

IMPROVEMENTS have recently been made by the Browne & Sharpe Manufacturing Company, Providence, R. I., on the high speed surface grinding attachment for use on Browne & Sharpe No. 2 surface grinding machines. This attachment is a mechanism for driving small grinding wheels, ⅜ in. to 1¼ in. in diameter, at a high rate of speed and is readily and quickly applied to the machine. Slots and similar small surfaces the location of which does not permit the use of a large diameter wheel can be rapidly ground with the attachment.

In applying the attachment to the machine, the wheel guard is removed and the attachment arm is securely clamped in position on the wheel head. This arm, extending upward, carries an adjustable bracket in which is mounted a countershaft. The grinding head is mounted on the main portion of the attachment arm with its spindle parallel to the spindle of the machine. Both the grinding head and the countershaft bracket are adjustable for belt stretch.

The drive is taken from a pulley, mounted on the spindle of the machine in place of the regular grinding wheel, by a canvas belt, to a pulley on the outer end of the countershaft. A second canvas belt transmits the drive from a larger pulley, mounted on the opposite end of the countershaft, to the grinding head. Option is given on grinding heads of different capacities.



High speed grinding attachment applied to the Brown & Sharpe No. 2 surface grinder

High-frame guided rod steam hammer

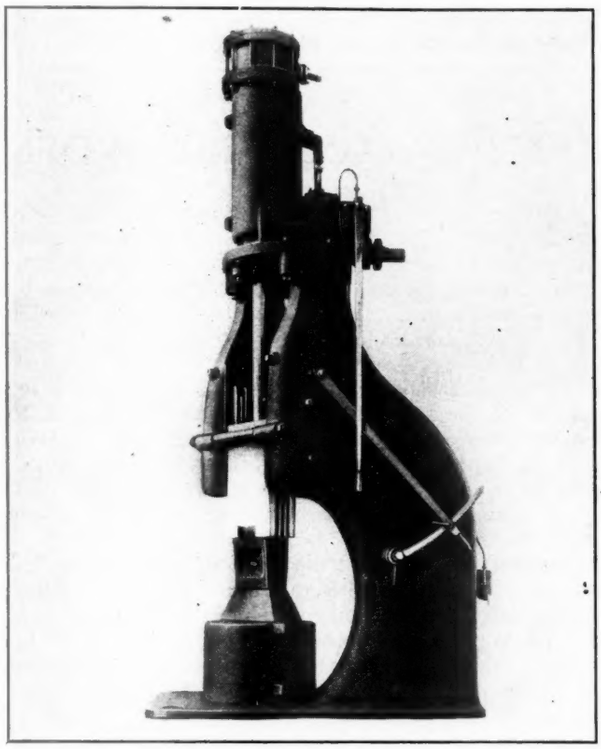
LARGE working space is featured in the high-frame steam hammers made by the Chambersburg Engineering Company, Chambersburg, Pa. An advantage of these hammers is that they permit the forging of large disks, rings, etc., and the upsetting of high stems, the forming of arch bars, etc., with the most economical size of tools. Long punching with drifts is also facilitated.

The steam joint employed on most hammers between the intake stuffing-box and the cylinder has been eliminated. Another advantage is that the self-draining cylinder dispenses with the long delays sometimes necessary in pumping condensate from cylinders. A patented safety cover keeps the volume of steam or air pumped per stroke at a minimum. The throttle valve is of the rotary self-seating type and the operating valve is ground into a removable cage.

Vertical alinement is obtained by inserted guides which are supported wholly by the frame, each in a five-bearing pocket independent of the guide clamp

bolts. The guide adjusting wedges are positioned independently of the guides and have a full bearing to avoid a rocking tendency. Tie-bars reinforce the frame at the guides.

The patented safety cylinder cover provides a cushion of live steam or air at the top of the cylinder. This provision limits the stroke to protect the cylinder and eliminates the hazard and expense of broken cylinder covers in the event that the rod should break or loosen. A safety valve shuts off the steam or air in case the valve gear should become damaged.



Chambersburg hammer with increased distance from the die to the underside of the frame

The throttle and operating valves

Standard forging hammers of this line range in capacity from 700 lb. to 6,000 lb. and in length of stroke, from 23 in. to 48 in. Rod hammers of the line, which are particularly adapted to forging work requiring an exceptionally high clearance, range in size from 400 lb. to 4,000 lb. and in length of stroke, from 18 in. to 48 in.

Keyless chucks for use on drilling machines

THE Jacobs Manufacturing Company, Hartford, Conn., in connection with its starardization, has added two chucks to its plain bearing line, which are used for drilling and tapping operations. The chuck shown in Fig. 1 is the No. 36 model which has a capacity of 3/16 in. to ¾ in. and weighs two pounds twelve ounces—very little more than chucks of ½ in. and ⅝ in.

Fig. 1—Jacobs plain bearing No. 36 model keyless chuck

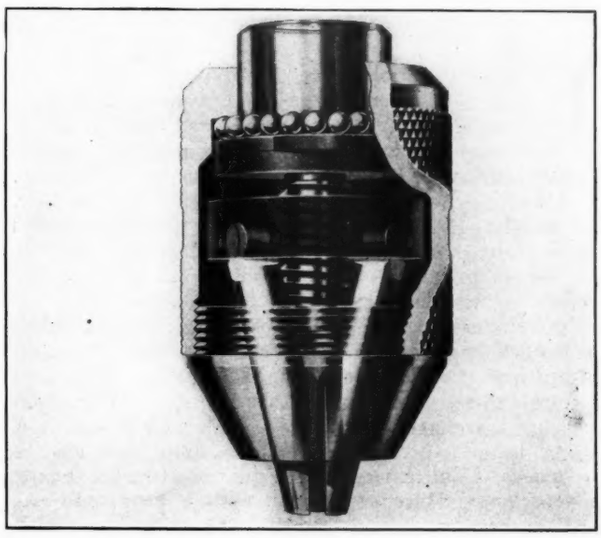


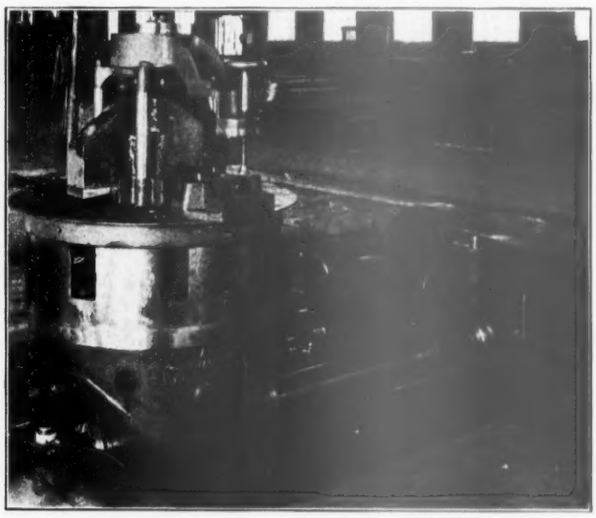
Fig. 2—Keyless Portomatic chuck

capacity. It has been designed especially for use on portable tools in which field it has formerly been necessary to use Morse taper shank drills where the capacity was 5/8 in. or over. By using this chuck it is possible to handle in portable tools straight shank drills, taps, reamers or the spindles of honing devices.

The keyless Portomatic chuck, shown in Fig. 2, is designed particularly for use on portable tools and for light drilling where the keyless or hand operated feature is desirable. The chuck tightens automatically as the load upon the drill increases, yet the drill may be readily released by a twist of the knurled sleeve. The chuck is simple and sturdy in construction and the parts are hardened and ground on all surfaces. It can be furnished to fit all standard tapers and threads and is produced in capacities of 1/4 in., 5/16 in., 3/8 in. and 1/2 in. Standard equipment includes a collar for holding the spindle of the drill during the releasing operation.

Universal coping machine for steel car work

A UNIVERSAL coping machine of new design has been placed on the market recently by the Beatty Machine & Manufacturing Company, Hammond, Ind., which is intended to speed up and consequently to reduce the unit cost of car shop work.



Beatty universal coping machine with turret head

The machine is of rugged yet compact construction, the feature of particular interest being the turret head with four sizes of cutting knives. This permits cutting both ends of a beam or channel without turning it, simply by cutting one end, passing the beam or channel by the machine, revolving the turret head and cutting the other end without tool change or any unnecessary floor to floor handling.

The No. 2 size Beatty universal coper can be used for material of the following sizes: Head No. 1, 2-in. to 8-in. channels or 3-in. to 9-in. I-beams; head No. 2 9-in. to 12-in channels or 9-in. to 12-in. beams; head No. 3, 12-in. to 18-in. channels, or 14-in. to 24-in. beams; head No. 4 takes care of all web cutting within the above range.

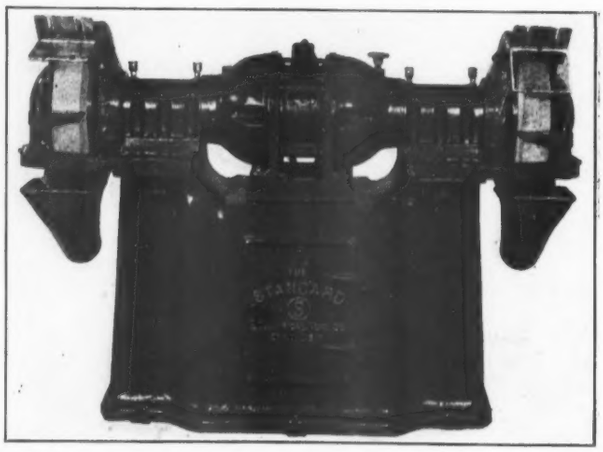
The head and coping tools revolve by power applied through friction clutches. Three standard coping knives, namely, 5-in., 3-in. and 2-in. in width, are always available, coping without tool change from 2-in. to 24-in. beams. One web-cutting tool for notching webs after the flanges are cut is also ready at all times and works both right and left hand.

The machine is operated through a solenoid to the main clutch and the head revolves by raising a hand lever in front of the machine. In working plates or small parts, three or four men can work around the machine. The head has force-feed lubrication throughout. The machine is built in several sizes to suit shop conditions and special heads and knives can be applied for special work. Small shop space required frequently is a decided advantage.

Standard heavy duty grinder

THE heavy-duty electrically driven grinder illustrated has been added to the line of similar equipment put out by The Standard Electrical Tool Company, Cincinnati, Ohio. The machine is made in three sizes of 5, 7½ and 10 hp. capacity. The 5-hp. grinder carries two wheels, 18 in. diameter by 3 in. face, and weighs 1,920 lb.. The 7½-hp. grinder carries wheels 24-in. diameter by 4 in. face and weighs 2,020 lb. The 10-hp. grinder carries wheels 24-in. diameter by 4¾-in. face, and has a weight of 2,375 lb.

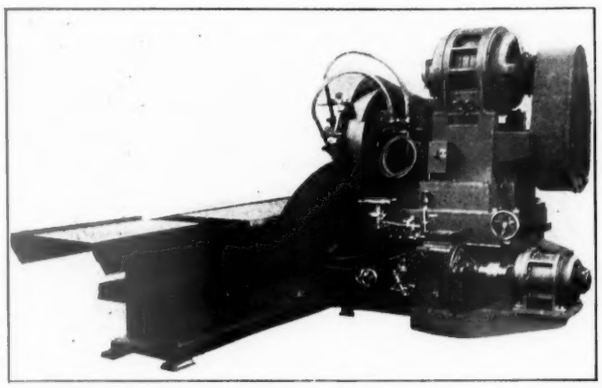
The grinders are equipped with 40-deg. General Electric motors, having push button control. Four S. K. F. ball bearings are used to support the spindle. The bearings are encased in dust proof chambers, and the armature shafts are made of a high grade nickel steel. A locking device is provided to hold the shaft when changing wheels. The emery wheel guards are of a heavy construction and are of the hinge door type with exhaust connections. Each guard is fitted with a spark breaker as well as a polished, wire-glass eye shield.



Ball-bearing grinder developed by the Standard Electrical Tool Company

Redesigned heavy duty face grinder

A REDESIGNED heavy duty face grinder equipped with a 42-in. sectional grinding wheel and hydraulic table drive has been placed on the market by the Bridgeport Safety Emery Wheel Company, Bridgeport, Conn. It includes several features to facilitate easy and fast operation. One of the important features is the infinite gradation of table speeds which makes it possible to obtain exactly the right speed for any kind of material, finish or condition. Other improvements are the method of mounting the spindle, the convenient spindle brake, the completeness of the feed arrangements and the foot treadle carriage reversal. Special attention has been given to rigidity in order that the extremely heavy loads, which are often encountered in this class of grinding, may be properly met.



The right side of the No. 94 Bridgeport heavy duty face grinder equipped with a hydraulic drive

The maximum length, height and width of the work that can be held on the table is 86 in., 33 in. and 32 in., respectively. The height from the floor to the top of the table is 34 in. The driving gears are splash lubricated, the feed screw is oil immersed and high pressure lubrication is used wherever necessary.

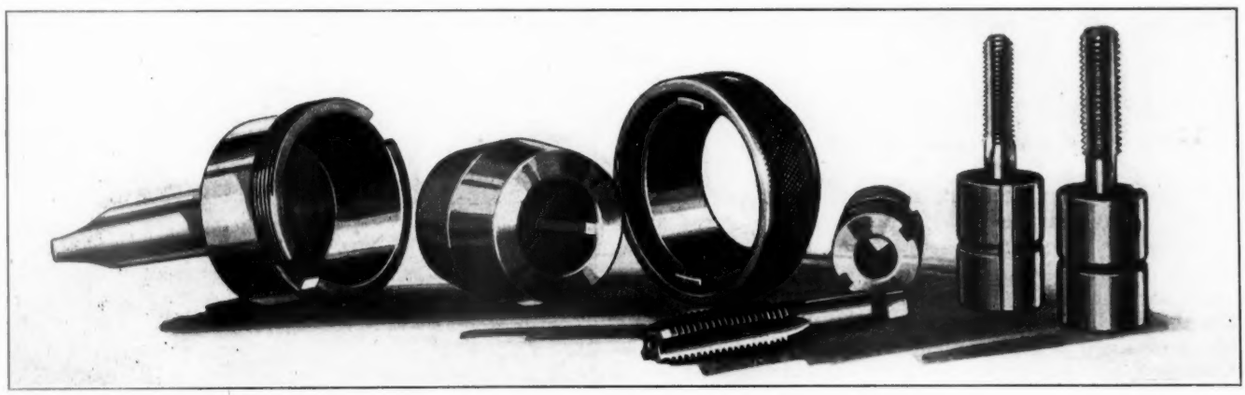
An a. c. 60 or 75-hp. or a d. c. 60-hp. motor may be used for the main drive. The speeds range from 700 to 900 r.p.m. A 7½-hp. motor is used for the carriage drive. A 1-hp. motor at 1,200 r.p.m. is used for the pump. A 1-in. pitch, 10-in. wide, link-belt silent type main driving chain is used. The chain is completely enclosed in an oil bath. The machine requires a floor space of 28 ft. 4 in. by 10 ft. 6 in.

A tap holder designed to prevent breakage

A HOLDER designed to prevent tap breakage on machine tapping has been placed on the market by the McCroskey Tool Corporation, Meadville, Pa. It fits directly into the spindle of a drilling machine, the turret of a turret lathe, an engine lathe tail stock, or the spindle of an electric drill. It is compact and reduces to a minimum the overhang below the spindle. The holder enables the operator to drive the tap up to its full capacity. Just as soon as this point is passed, or the tap meets an obstruction, or hits the bottom of a blind hole, the friction slips and the tap stops.

There are only five parts, including the bushing that holds the tap. The plug that receives the bushing is tapered both ways. Each taper fits into a fibre-lined cup. The knurled collar is a differential nut that draws the lower cup toward the upper to increase the friction. The ratio of the threads in the collar provides for a sensitive and positive adjustment of friction. The tap is driven by the square end and the bushing is driven by two keys and floats in the holder. It is held in place by a ball and spring retainer. Should the spindle be raised too rapidly in backing out the tap, the bushing will be drawn out of the holder without injury to the tap.

The holder and bushings are made in three different sizes. The three sizes combined, handle the standard hand taps from 3/16 in. to 1¼ in., and pipe taps from ⅛ in. to 1 in. Special bushings for taps with special shanks and for setting nuts can also be furnished.

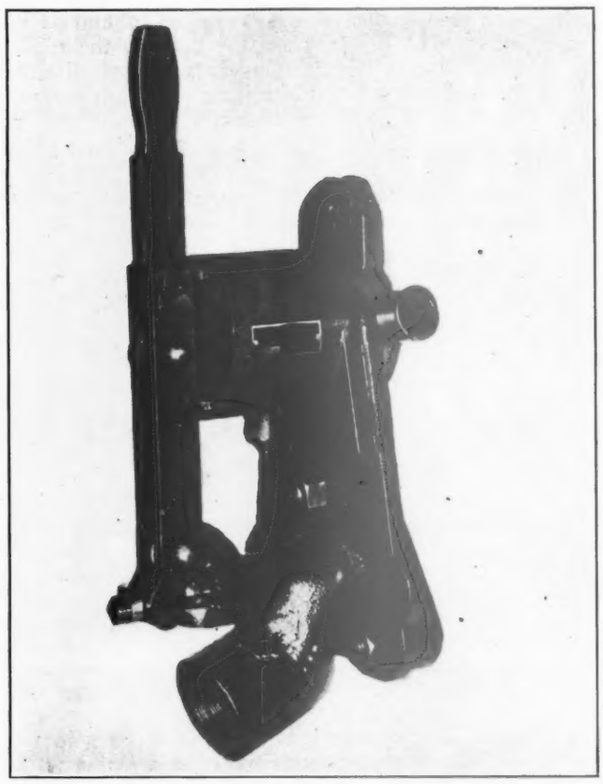


The parts of the McCroskey tap holder

AUTOMATIC SURFACE GRINDER.—The Blanchard Machine Company, 64 State street, Cambridge, Mass., gives in an attractive catalogue of 16 pages specifications and a general description of its No. 16-A automatic surface grinder which is particularly adapted for the quantity production of small pieces. Production data is given in the captions under the many illustrations of typical work.

A power blow-off for locomotives

THE Bird-Archer Company is introducing an attachment for operating locomotive blow-off cocks by power. The device has two parts, the power attachment proper and a cab-operating valve. The power attachment is bolted to the blow-off cock and consists of an air cylinder and a two-way piston connected to an upright lever which opens and closes the blow-off. One face of this piston exposes a full surface to the air pressure while the exposed area of the other face is greatly reduced. Two small pipes connecting ports in



The Wilson power blow-off device

the cylinders with the operating valve in the cab furnish the air with which the device is operated.

When air enters the back end of the cylinder, the piston is forced out, opening the blow-off cock valve, while air entering the front end of the cylinder moves the plunger backward, thereby closing the blow-off. The air is obtained from the main air reservoir of the locomotive.

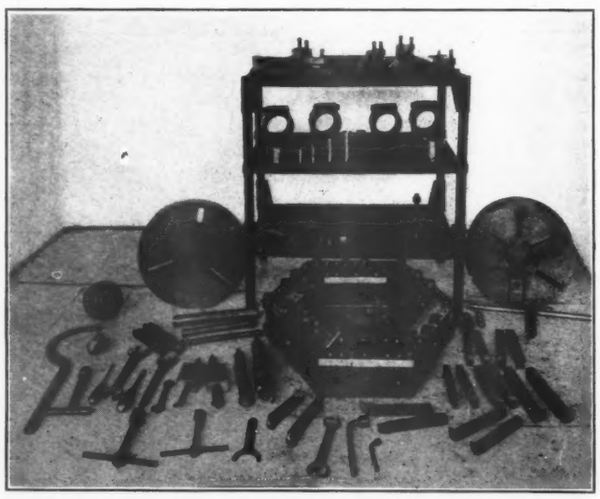
The function of the cab-operating valve is not only to supply air pressure to the cylinder so that the blow-off cock can be opened or closed as required, but also to cushion the movement. The cab device has two valves, both operated by the same lever. The forward valve governs the air for opening the blow-off while the air from the rear valve closes it. When the cab lever is moved forward, it engages the rear valve before coming into contact with the forward valve. In this position, air from the reservoir passes into the front end of the cylinder, pushing the piston backward, thus closing the blow-off. Meanwhile any air in the back end of the cylinder is forced through the pipe to the forward valve in the cab mechanism where a small hole permits a gradual release. The effect of this is to maintain a sufficient back pressure in the cylinder to avoid the danger of a sudden closure of the blow-off cock valve under the steam pressure in the boiler.

As the cab lever is moved ahead or into the second position, it comes into contact with the forward valve which lets air from the reservoir into the back end of the power cylinder, with the consequent opening of the blow-off valve against the air pressure maintained on the reduced area of the front face of the piston, thereby cushioning the movement. In normal operation, the cab lever is moved the entire distance when opening the blow-off valve and released to close it, the blow-off cock closing automatically as soon as the air pressure in the cylinder has completely escaped.

The cab valve is an adaptation of the McGrath air hammer valve, and the apparatus as a whole is called the Wilson Power Blow-off after the inventor, L. F. Wilson, vice-president of the manufacturing company. While designed primarily for use in connection with the Bird Archer blow-off, it is adapted for operation with any type in which the blow-off valve is normally in the closed position. Its outstanding feature lies in permitting operation from the cab of locomotives without restricting the position of the blow-off cocks on the firebox.

Redesigned chucking outfit for turret lathes

A NEW chucking outfit for all Hartness 12-in., 15-in. and 17-in. flat turret lathes has been placed on the market by the Jones & Lamson Machine Company, Springfield, Vt. In designing this revised chucking outfit, it has been the desire to make a standard



Redesigned chucking outfit for all Hartness flat turret lathes

outfit of tools which will actually be sufficient for the general run of work that comes to the ordinary turret lathe, so that the purchaser of a chucking lathe will be able to use the machine immediately upon its arrival without investment in any further or special tools. There is a sufficient number of tools in the outfit to allow of an extreme degree of multiple tooling on complicated work.

The forged tools supplied with the outfit are made of

larger sizes than previously furnished. The tool holders are of rigid design, utilizing standard tool bits. On the 12-in. and 15-in. machines, and on the 17-in. with a round turret, the tool plate is now made in one large ring rather than in sectors as previously. This construction makes for increased rigidity in tool mounting. The solid ring will be supplied with the standard chucking outfit. For combination bar and chucking work or for cases where special tools are to be used, the six part segments will be supplied.

Rapid fueling facilities for rail motor cars

THE S. F. Bowser & Co., Fort Wayne, Ind., has developed special motor-driven pumping and metering facilities for the rapid fueling of railway motor cars of either the gas or gas-electric type. With a 2-in. delivery hose this equipment will deliver 75 gal. of fuel

Fueling a gas-electric car with the aid of Bowser high-speed pumping equipment

per minute. An Xacto recording meter makes a continuous record of all fuel delivered.

In the layout illustrated, two discharge points are provided, one of which is shown. The discharge hose and nozzle is coiled when not in use and retained in a service box about 3 ft. deep wherein connection is made between the discharge pipe from the pump house and the discharge hose used in filling the cars.

One man can operate the system by first pushing a button on the pump house and then going out into the yard to fuel the car. The push-button is connected with a regular controller which starts the 110-volt 2-hp. motor on the pump. A by-pass valve on the pump opens as soon as the pump starts and remains open as long as the discharge nozzle valve is closed. When the latter is opened, as when filling the fuel tank, the by-pass valve closes and uninterrupted delivery of fuel is effected until the operator closes the nozzle valve. The by-pass valve then opens again to relieve the pressure.

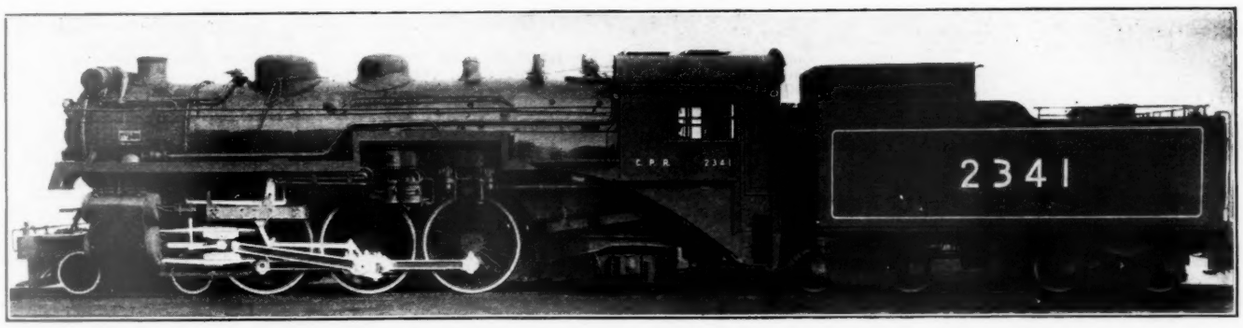
A storage tank of one carload capacity is buried underground near the pump house. Housed in the pump shed are proper filling accessories, together with a storage indicator to show the amount of fuel in the tank at all times, the motor-driven pump with attendant electrical apparatus, and the Xacto volumetric meter. This meter performs a dual function: first, it measures the total discharge up to 100,000 gal. and then repeats; second, it measures by means of a second dial, which can be set back to zero for each filling operation, total discharges up to 1,000 gal. In other words, before filling a rail motor car, the second or individual discharge meter is set back to zero. After filling the car this meter will then register the total number of gallons delivered to the car. Inasmuch as the setting back of the single delivery counter has no effect on the continuous counter, the Xacto meter provides a simple means of keeping a record of fuel delivered to each car as well as of total fuel deliveries over a period.

STANDARD TURRET LATHE TOOLING.—The Jones & Lamson Machine Company, Springfield, Vt., shows in catalogue form blue print and half-tone illustrations of the standard turret lathe tooling operations on the J. & L. chucking lathe.

CARNEGIE BEAM SECTIONS.—Profiles, properties and safe loads for additions to new series of structural steel beams and column sections are contained in the illustrated pamphlet of 12 pages issued by the Carnegie Steel Company, Pittsburgh, Pa.

BORING, DRILLING AND MILLING MACHINE.—The construction and operation of the G. & L. No. 45 horizontal boring, drilling and milling machine is described and illustrated in detail in an attractive 20-page catalogue issued by the Giddings & Lewis Machine Tool Company, Fond du Lac, Wis.

ROLLER BEARINGS FOR RAILROAD JOURNAL BOXES.—Concise statements, in the form of questions and answers, outlining the salient engineering facts regarding Hyatt equipped railroad journal boxes, are contained in a bulletin just issued by the Hyatt Roller Bearing Company, Newark, N. J. Sectional views show the details of this equipment.



A Canadian Pacific 4-6-2 type on display at the B. & O. centenary, Halethorpe, Md.

News of the Month

PROMOTIONS AND APPOINTMENTS I.C.C. THE SUPPLY TRADE CLUB AND ASSOCIATION NEWS NEW TRADE PUBLICATIONS NEW SHOPS

The recommendations governing the loading of lumber, logs, stone, structural materials, plates, rails, girders, etc., contained in the 1927 report of the American Railway Association Committee on Loading Rules, have been approved by letter ballot of the members and by the board of directors. These recommendations, together with revisions covered in Supplement No. 1 issued in April, 1927, are available for distribution in the form of a new supplement to the rules effective January 1, 1928. Copies can be obtained by addressing the secretary of the Mechanical Division.

Meetings and Conventions

THE AMERICAN SOCIETY FOR TESTING MATERIALS has selected Atlantic City as the location for its next annual meeting, which will be held on June 25-29, 1928. The meetings will be held at the Chalfonte-Haddon Hotel.

Mechanical convention date changed

The Mechanical Division of the American Railway Association, has changed the date of its next annual convention from June 13-20, 1928, to June 20-27, to avoid a conflict with the meeting of the National Electric Light Association.

The dates of the Purchases and Stores Division meeting has been changed to June 20-22.

W. E. Dunham addresses Chicago car foremen

Efficient car repair methods was the subject at the regular monthly meeting of the Car Foremen's Association, of Chicago, held at the Great Northern Hotel, December 12, the principal address being made by W. E. Dunham, superintendent of the car department of the Chicago & North Western. Mr. Dunham outlined effectively the principles which must govern both heavy and light car repair work in order to assure a maximum return for the money expended. The old way of hit or miss repair work is rapidly passing, and by scheduling the work and setting up a measuring stock of performance, which is entirely practicable today, a marked improvement in the efficiency of car repair shop methods can be achieved. Following the paper, Mr. Dunham showed by means of a moving picture how a series of 1,000 box cars were constructed in 1926 at the Chicago shops of the Chicago & North Western, many labor-saving methods and devices being illustrated.

The following list gives names of secretaries, dates of next or regular meetings and places of meeting of mechanical associations and railroad clubs.

AIR-BRAKE ASSOCIATION.—T. L. Burton, 165 Broadway, New York. Next meeting May 1-4, Detroit, Mich.

AMERICAN RAILROAD MASTER TINNERS', COPPERSMITHS' AND PIPEFITTERS' ASSOCIATION.—C. Borcherdt, 202 North Hamlin Ave., Chicago.

AMERICAN RAILWAY ASSOCIATION DIVISION V.—MECHANICAL.—V. R. Hawthorne, 431 South Dearborn St., Chicago. Next meeting June 20 to 27, 1928, inclusive, Atlantic City, N. J.

DIVISION V.—EQUIPMENT PAINTING SECTION.—V. R. Hawthorne, Chicago.

DIVISION VI.—PURCHASES AND STORES.—W. J. Farrell, 30 Vesey St., New York. Next meeting June 20-22.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—G. G. Macina, 11402 Calumet Ave., Chicago. Annual convention Hotel Sherman, Chicago, August 29-31, 1928.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. Thirty-ninth St., New York. Railroad Division, Marion B. Richardson, associate editor, *Railway Mechanical Engineer*, 30 Church St., New York.

AMERICAN SOCIETY FOR STEEL TREATING.—W. H. Eiseman, 4600 Prospect Ave., Cleveland, Ohio.

AMERICAN SOCIETY FOR TESTING MATERIALS.—C. L. Warwick, 1315 Spruce St., Philadelphia, Pa. Annual meeting June 25-29, Chalfonte-Haddon hotel, Atlantic City, N. J.

AMERICAN WELDING SOCIETY.—Miss M. M. Kelly, 29 West Thirty-ninth St., New York.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Joseph A. Andrucetti, C. & N. W., Room 411, C. & N. W. Station, Chicago, Ill.

BIRMINGHAM CAR FOREMEN AND CAR INSPECTORS' ASSOCIATION.—Maynard Rodgers, secretary, care Y. M. C. A., Birmingham, Ala. Meeting second Monday in each month at Birmingham Y. M. C. A. building.

CANADIAN RAILWAY CLUB.—C. R. Crook, 129 Charon St., Montreal, Que. Regular meetings, second Tuesday in each month, except June, July and August, at Windsor Hotel, Montreal, Que. Next meeting January 10. Paper on the properties of manganese steel will be presented by John H. Hall, chief metallurgical engineer, Taylor-Wharton Iron & Steel Co., High Bridge, N. J. Moving picture illustrations.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 626 N. Pine Ave., Chicago, Ill. Regular meeting second Monday in each month, except June, July and August. Great Northern Hotel, Chicago. Next meeting January 9. Discussion of new A. R. A. Rules.

CAR FOREMEN'S ASSOCIATION OF ST. LOUIS.—R. E. Giger, 721 North 23rd St., E. St. Louis, Ill. Regular meeting first Tuesday in each month, except June, July and August.

CAR FOREMEN'S CLUB OF LOS ANGELES.—J. W. Krause, 514 East Eighth St., Los Angeles, Cal. Meeting second Friday of each month in the Pacific Electric Club building, Los Angeles, Cal.

CENTRAL RAILWAY CLUB.—H. D. Vought, 26 Cortlandt St., New York. Regular meetings second Thursday each month, except June, July and August, at Hotel Statler, Buffalo. Next meeting January 12. Reports and election of officers, 2 p. m.; annual dinner 7 p. m. Speakers, Mr. Fitzgerald chairman, Committee on Public Relations, New York, and Rev. Jos. Hanley Perry, N. Y.

CHIEF INTERCHANGE CAR INSPECTORS' AND CAR FOREMEN'S ASSOCIATION.—(See Railway Car Department Officers' Association.)

CINCINNATI RAILWAY CLUB.—D. R. Boyd, 330 Beekman St., Cincinnati. Regular meeting second Tuesday, February, May, September and November.

CLEVELAND RAILWAY CLUB.—F. L. Frericks, 14416 Adler Ave., Cleveland, Ohio. Meetings first Monday each month, except July, August and September, at Hotel Hollenden, East Sixth and Superior Ave., Cleveland. Annual meeting January 9.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—W. J. Mayer, Michigan Central, 2347 Clark Ave., Detroit, Mich. Next meeting Hotel Sherman, Chicago, August 21-23, 1928.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—L. G. Plant, Railway Exchange, 80 E. Jackson Boulevard, Chicago. Next meeting Chicago, May 7-11, 1928.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—William Hall, 1061 W. Wabash Ave., Winona, Minn. Annual convention Hotel Sherman, Chicago, September 4-7, 1928.

LOUISIANA CAR DEPARTMENT ASSOCIATION.—L. Brownlee, New Orleans, La. Meetings third Thursday in each month.

MASTER BOILERMAKERS' ASSOCIATION.—Harry D. Vought, 26 Cortlandt St., New York. Annual meeting Cleveland, Ohio, May 22-25.

NEW ENGLAND RAILROAD CLUB.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meeting second Tuesday in each month, excepting June, July, August and September, Copley-Plaza Hotel, Boston. Next meeting January 10. W. J. Backes, chief engineer of the Boston & Maine, will talk on the activity of the B. & M. in the recent flood.

NEW YORK RAILROAD CLUB.—H. D. Vought, 26 Cortlandt St., New York. Meetings third Friday in each month, except June, July and August, at 29 West Thirty-ninth St., New York.

PACIFIC RAILWAY CLUB.—W. S. Wollner, 64 Pine St., San Francisco, Cal. Regular meetings, second Thursday of each month in San Francisco and Oakland, Cal., alternately. Next meeting January 12, Palace hotel, San Francisco. Paper on types of railway securities will be read by Charles R. Pettit, chief statistical department, Howard F. McCandless & Co.

RAILWAY CAR DEPARTMENT OFFICERS' ASSOCIATION.—A. S. Sternberg, Belt railway, Clearing Station, Chicago.

RAILWAY CLUB OF GREENVILLE.—Paul A. Minnis, Bessemer & Lake Erie, Greenville, Pa. Meeting last Friday of each month, except June, July and August. Next meeting January 17. Lawrence D. Spaulding, valuation engineer of the Bessemer & Lake Erie, will discuss some phases of railroad valuation.

RAILWAY CLUB OF PITTSBURGH.—J. D. Conway, 515 Grandview Ave., Pittsburgh, Pa. Regular meeting fourth Thursday in month, except June, July and August. Fort Pitt Hotel, Pittsburgh, Pa.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, M. P. O. Drawer 24, St. Louis, Mo. Regular meetings, second Friday in each month, except June, July and August. Next meeting January 13. Paper on railroad safety will be read by Chas. E. Hill, general safety agent, New York Central Lines.

SOUTHERN AND SOUTHWESTERN RAILWAY CLUB.—A. T. Miller, P. O. Box 1205, Atlanta, Ga. Regular meeting third Thursday in January, March, May, July, September and November. Annual meeting third Thursday in November. Ansley Hotel, Atlanta, Ga.

SOUTHWEST MASTER CAR BUILDERS' AND SUPERVISORS' ASSOCIATION.—B. B. Parker, St. Louis-Southwestern, Tyler, Tex. Annual meeting August 4, 5 and 6 at Galveston, Tex.

TEXAS CAR FOREMEN'S ASSOCIATION.—A. I. Parish, 106 West Front St., Fort Worth, Tex. Regular meetings first Tuesday in each month. Terminal Hotel bldg., Fort Worth, Tex.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, 1177 East Ninety-eighth St., Cleveland, Ohio. Annual meeting Hotel Sherman, Chicago, October, 1928.

WESTERN RAILWAY CLUB.—W. J. Dickinson, 189 West Madison St., Chicago. Regular meetings, third Monday in each month, except June, July and August.

Supply Trade Notes

J. J. Hennessy has opened an office at 136 Liberty street, New York City. Mr. Hennessy manufactures and distributes Hennessy journal lubricators.

The Harnischfeger Corporation, Milwaukee, Wis., has established a branch office at 340 Rockefeller building, Cleveland, Ohio. J. G. Conners is district manager.

J. D. Brandon has been appointed vice-president of the American Arch Company with headquarters at Chicago. He entered the service of the Cleveland, Cincinnati, Chicago & St. Louis in 1906, remaining with that road until 1915 as general foreman at the Indianapolis shops. He then entered the service of the American Brake Shoe & Foundry Company in 1915 at New York. In 1919 he went to the service department of the American Arch Company at Montreal, where he stayed until 1924, at which time he joined the Pittsburgh Steel Products Company in the sales department, leaving that work on May 1, 1927, to return to the American Arch Company as assistant to senior vice-president which position he held until appointed vice-president as above noted.

J. D. Brandon

L. J. Melson, who represented the Reading Iron Company, Reading, Pa., in the South, has been promoted to district sales representative in the Cincinnati, Ohio, office.

The Hale & Kilburn Co., and the Six Wheel Company have removed their offices from 30 Church street to 2104 Graybar building, 420 Lexington avenue, New York City.

David Newhall, manager of sales of freight cars and auxiliary locomotives, of the Bethlehem Steel Company, with offices at New York, has resigned.

Harry V. Wille, consulting vice-president concerning engineering and metallurgy of the Baldwin Locomotive Works, Philadelphia, Pa., died on November 29, at Philadelphia.

C. J. Buck has been appointed service manager of the Franklin Railway Supply Company, Inc., New York, succeeding John L. Bacon, who has resigned to enter business for himself.

Joseph Wainwright for many years associated with Manning, Maxwell & Moore, has joined the sales organization of the Consolidated Machine Tool Corporation of America, with headquarters at Rochester, N. Y.

Brent A. Tozzer, New York sales manager of the Niles Tool Works Company and Pratt & Whitney Company, New York City, has resigned. Mr. Tozzer expects to announce his new plans about the first of the coming year.

A. E. Munch, formerly of the Hewitt Company, Railway Exchange, Chicago, has entered the employ of the United States Metallic Packing Company, Philadelphia, Pa. Mr. Munch will have his headquarters at Chicago.

The Kearney & Trecker Corporation, Milwaukee, Wis., has opened a new factory branch office and showroom at 5924 Second Boulevard, Detroit, Mich., in charge of R. W. Burk, assisted by George E. Gustafson and William Mirgeler.

The Harrington Company, Philadelphia, Pa., has sold its machine tool business, together with drawings, patterns, jigs, tools and fixtures, patents and goodwill to the Consolidated Machine Tool Corporation of America, Rochester, N. Y.

Joseph T. Ryerson & Son, Inc., Chicago, recently took over the distribution of the Foote-Burt line of drills to the railroads. Foote-Burt equipment includes machines for single and multiple spindle drilling for a great variety of work such as mud rings, flue sheets, etc.

The Bradford Corporation, New York, will in future handle the business of the Walker Draft Gear Company, and Edmund H. Walker, heretofore president of the latter company, has been appointed a vice-president of the Bradford Corporation, with headquarters at New York.

The Pilliod Company, with offices at New York City and Chicago, manufacturers of the Baker, Southern and Young valve gears, have acquired the exclusive sales and service of the locomotive cut-off control manufactured by the Transportation Devices Corporation, Indianapolis, Ind.

M. J. Schmitt, formerly in charge of the Milwaukee branch of Kearney & Trecker Corporation, Milwaukee, Wis., has been promoted to assistant sales manager. Mr. Schmitt will continue to look after the Milwaukee territory with the assistance of R. F. Shaw, who is being transferred from Chicago to the home office at Milwaukee.

H. W. Ostrom, chief chemist of the Chicago, Milwaukee & St. Paul, with headquarters at Milwaukee, Wis., has resigned to become connected with the Aluminum Company of America with headquarters at Chicago. Mr. Ostrom's new work will include the sales development of aluminum bronze powder for paint used by railroads.

A. E. R. Turner, district sales manager of the Niles Tool Works Company, Hamilton, Ohio, with headquarters at Cleveland, Ohio, has resigned to become district sales manager of John Bertram & Sons Company, Ltd., Dundas, Ont., with headquarters at Montreal, Que., and will be succeeded temporarily by James D. Allan.

L. M. Ritchie, who has been appointed district manager, railway sales, of the E. I. du Pont de Nemours & Company, Inc., with headquarters at Chicago, was born on March 20, 1892, at Bernise, Pa., and graduated from Allegheny College in 1916 and received his master's degree in 1917 at the above college in chemistry. He then served as a member of the staff of the U. S. Bureau of Standards at Washington, D. C., as assistant chemist in the Electro Chemistry section of the Electrical division and in 1919 was appointed associate chemist and assistant chief of this section. In 1922 he resigned and was appointed district sales engineer of the National Carbon Company, Inc., and the Prest-O-Lite Company, with headquarters at Cleveland, Ohio, which position he held until his recent appointment.

L. M. Ritchie

Alfred L. Carlson recently joined the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., as sales engineer, with headquarters in New York City, to take care of the eastern territories. Mr. Carlson was formerly connected with the Gisholt Machine Company, Madison, Wis.; the Otis Elevator Company, New York, and the Henry Prentiss Company, New York.

J. E. Lewis, president of the Harbison-Walker Refractories Company, at Pittsburgh, Pa., has ben elected a director of the American Arch Company, of New York. The American Arch Company holds a substantial stock interest in the Harbison-Walker Refractories Company, and it is believed that the former

company will soon have representation on the Harbison-Walker board.

The Gould Car Lighting Corporation announces the sale of its patents, patent rights, trade marks, and good will in its car lighting business to the Simplex Equipment Company, Inc., New York. The Gould Corporation is retiring from the car lighting field because that department of its business, due to unsatisfactory prices and limited market, has not been profitable. The Simplex Equipment Company, Inc., will be in position to service and maintain all types of Gould equipment.

Joseph T. Ryerson & Son, Inc., Chicago, has taken over the exclusive sale of the Glasgow iron billets to the railroads of the country. Glasgow iron is a pure puddled doubly refined rolled wrought iron, made by the Glasgow Iron Company, Pottstown, Pa. This firm, organized in 1876, are manufacturers of iron plates, bars, billets and boiler specialties. For many years they have been specializing in the manufacture of refined iron. The Ryerson Company organization also handles the sale of the Lewis special staybolt and engine bolt iron product of the Penn Iron & Steel Co., Creighton, Pa.

Nathaniel W. Sample, Sr., for many years connected with the Baldwin Locomotive Works, died suddenly at his home in Philadelphia, Pa., on October 27. Mr. Sample was in his eighty-fourth year at the time of his death. From 1871 to 1876 Mr. Sample was consecutively machinist and foreman of shops of the Denver & Rio Grande (now the Denver & Rio Grande Western), and then until 1886 served as master mechanic. From 1886 to 1891, he was superintendent of machinery and from the latter time until September, 1900, was general superintendent of the same road, later serving as consulting engineer of the Rio Grande Western (part of the Denver & Rio Grande Western). Since 1900, among other duties, he had charge of apprentices in the shops of the Baldwin Locomotive Works.

W. J. Walsh, vice-president of the Galena Signal Oil Company with headquarters at Chicago, has resigned to become president of the Transportation Service Corporation, Chicago. He entered railway service in 1886 as an apprentice in the shop of the Cleveland, Cincinnati, Chicago & St. Louis at Cleveland, Ohio. In 1889 he was made a machinist on the Cincinnati, New Orleans & Texas Pacific and during the period to 1891 was a locomotive engineer, a general foreman, and a mechanical instructor on the first airbrake car ever constructed. In the latter year, he was promoted to division master mechanic, which position he held until 1896, when he resigned to become lubrication engineer of the Galena Signal Oil Company at Chicago. In 1910 he was promoted to manager of the Chicago district, and on February 4, 1920, he was elected vice-president, which position he has held until his resignation.

W. J. Walsh

Fred J. Fisher, of Fisher Brothers, Detroit, Mich.; Clarence R. Bitting, also of Fisher Brothers, and Arthur W. Cutten, of Chicago, have been elected directors of the Baldwin Locomotive Works. Thomas G. Ashton resigned as a director and was succeeded by his son-in-law, Joseph Neff Ewing, of Philadelphia. This increases the number of directors on the board from 12 to 15 members.

John R. Mitchell, sales engineer for W. H. Miner, Inc., who died on November 7 at Chicago, was born in 1873 at Lafayette, Ind. He attended Purdue University and in 1891 entered the employ of the Chicago and North Western as a special apprentice; thereafter he worked in the testing department about a year, and was later in charge of the dynamometer car. From 1899 to 1902 he was an enginehouse foreman on the Galena division, and general foreman at Ashland, Wis., and Green Bay. In 1902 he was appointed master mechanic on the Atchison, Topeka & Santa Fe at Cleburne, Tex., and later returned to the Chicago and North Western, where he served as testing engineer, being located at Pittsburgh, Pa. Mr. Mitchell became associated with W. H. Miner, Inc., as mechanical engineer in May, 1902, and in 1906 was appointed sales engineer, which position he held until his death.

J. C. Whitridge, vice-president of the Buckeye Steel Castings Company, Columbus, Ohio, has been elected president to succeed S. P. Bush, resigned. J. B. Goodspeed succeeds Mr. Whitridge. Mr. Bush was born on October 4, 1863, at Brickchurch, N. J., and graduated from the Stevens Institute of Technology in 1884. He entered railway service on May 1 of the same year as an apprentice in the shops of the Pennsylvania at Logansport, Ind., and in 1886, was transferred to the Columbus, Ohio, shops. In 1888, he became a draftsman at Columbus and two years later was promoted to assistant engineer of motive power. In 1891 he was appointed master mechanic at Dennison, Ohio, and at the end of that year was appointed master mechanic of the principal shops at Columbus, which position he held until 1894 when he was promoted to superintendent of motive power on the Southwest System. He held the latter position until 1899 when he resigned to enter the employ of the Chicago, Milwaukee & St. Paul as general superintendent of motive power, which position he held until 1901, when he resigned to become vice-president and general manager of the Buckeye Steel Castings Company. In 1908 he was elected president, which position he held until his resignation.

S. P. Bush

Andrew H. McDougall has been elected vice-president and director of sales of the Whiting Corporation, Harvey, Ill. Mr. McDougall was graduated from Michigan University with an M. E. degree in 1901; during 1900 he served as a machinist with the E. D. Smith Company on the Michigan-Lake Superior power canal project, Sault Ste. Marie, Ontario; also as a machinist for the Allis-Chalmers Mfg. Co., Milwaukee. From 1901 to 1903 he was a designer of special wood and iron working machinery for the Studebaker Brothers Manufacturing Company, South Bend, Ind. In 1903 he went as a designer to the Whiting Foundry Equipment Co. (now the Whiting Corporation), Harvey, Ill., and subsequently served successively as estimator, chief draftsman, chief engineer, vice-president and consulting engineer, and now becomes vice-president and director of sales for the Whiting Corporation.

W. H. Woodin, American Locomotive Company president

William H. Woodin, chairman of the board of the American Locomotive Company, has been elected also president, to succeed Frederick F. Fitzpatrick, deceased. Mr. Woodin was first elected president of the American Locomotive Company in December, 1925, succeeding Andrew Fletcher, deceased. When the Railway Steel-Spring Company was amalgamated with the American Locomotive Company in 1926, Mr. Woodin was made chairman of the board of the American Locomotive Company, and Frederick F. Fitzpatrick, who had served as president of the Railway Steel-Spring Company since 1910, was made president. Mr. Woodin now combines the offices of chairman of the board and president. He is also president of the American Car & Foundry Company.

Harry Barnard, mechanical superintendent of the Union Draft Gear Company, Chicago, died on November 17, following an extended illness.

Personal Mention

General

M. E. HAMILTON has been appointed general air brake instructor of the Denver & Salt Lake, with headquarters at Utah Junction, Colo.

FRANK W. JOHNSON has been appointed traveling engineer of the Minneapolis, St. Paul & Sault Ste. Marie, with headquarters at Minneapolis, Minn., succeeding Grant W. Stanton, transferred.

E. R. BATTLEY, having completed special duties assigned to him, has resumed his position as superintendent of motive power of the Central region of the Canadian National, with headquarters at Montreal, Que.

M. E. FOSTER has been appointed inspector of rail motor car maintenance of the Boston & Maine, with headquarters at Boston, Mass. The position of supervisor of rail motor car maintenance has been abolished.

R. L. KLEIST has been appointed chief joint interchange inspector at Pueblo, Colorado. Previous to this appointment Mr. Kleist was general foreman, car department, of the Baltimore & Ohio, at Lorain, Ohio.

C. JAMES, mechanical superintendent of the Eastern district of the Erie, with headquarters at Hornell, N. Y., has been appointed superintendent of motive power, with headquarters at New York, succeeding W. S. Jackson, resigned.

CHARLES M. HOUSE, who has been promoted to superintendent of motive power and equipment of the Chicago & Alton, with headquarters at Bloomington, Ill., received his first instruction in the construction of rolling stock as a carpenter and a blacksmith with the American Car & Foundry Company at St. Charles, Mo. Mr. House was later promoted to a position in the engineering department. Prior to his connection with the Alton in 1918 he was employed in the engineering department of the Danville Car Company and in the mechanical department of the Union Pacific at Omaha, Neb. In 1918 Mr. House was appointed chief draftsman in the mechanical department of the Alton at Bloomington, becoming general car foreman, with headquarters at the same point in 1920, a position he held continuously until his promotion to superintendent of motive power and equipment on October 20.

C. M. House

A. T. MILLER has been appointed assistant to superintendent of motive power of the Atlanta & West Point, the Western Railway of Alabama and the Georgia Railroad, with headquarters at Atlanta, Ga.

GROVER C. CARVER, road foreman of engines of the Boston & Maine, with headquarters at Boston, Mass., has been appointed supervisor of rail motor cars, having general supervision over rail motor car maintenance and operations, with the same headquarters.

The jurisdiction of A. P. Prendergast, mechanical superintendent of the Texas & Pacific, with headquarters at Dallas, Tex., has been extended to give him authority over all mechanical forces and equipment of the Cisco & Northeastern, the Abilene & Southern, the Pecos Valley Southern, the Weatherford, Mineral Wells & Northwestern and the joint New Orleans terminal properties of the Texas & Pacific and the Missouri Pacific. Mr. Prendergast formerly served these companies in a consulting capacity.

MILO P. LYBECK, assistant fuel supervisor of the Minneapolis, St. Paul & Sault Ste. Marie, at Enderlin, N. D., has been appointed traveling engineer of the Stevens Point division, with headquarters at Stevens Point, Wis., succeeding Charles F. Gillapsy, resigned.

ALFRED G. HOPPE, assistant engineer of tests of the Chicago, Milwaukee & St. Paul, at Milwaukee, Wis., has been appointed engineer of tests, with headquarters at Milwaukee. Mr. Hoppe will have jurisdiction over all test matters including material inspection and the chemical laboratory.

CHARLES JAMES, who has been appointed superintendent of motive power of the Erie, with headquarters at New York, was born on October 7, 1866. He entered the service of the Erie on December 19, 1890, as a machinist at Huntington, Ind., and remained in this position until February 28, 1891. From March 1, 1891, until November 30, 1900, he was successively enginehouse foreman, engine dispatcher and gang foreman at Huntington, Ind. He then became general foreman at Chicago, a position he held until September 30, 1902. From this time until September 30, 1906, Mr. James held the position of general foreman successively at Huntington, Ind., Hornell, N. Y., and Port Jervis, N. Y. At the latter time he was appointed master mechanic at Avon, N. Y., and served in that capacity successively at the following places until August 31, 1914: Galion, O., Port Jervis, N. Y., and Jersey City, N. J. At the latter time he was appointed mechanical superintendent, lines West, serving in this capacity at Youngstown and Cleveland, O., until February 29, 1920. He served in that position on the Hornell region at Hornell, N. Y., until September 30, 1920, on the Ohio region at Youngstown, O., from October 1, 1920, until February 28, 1921, on the Ohio and Chicago regions at Youngstown from the latter time until February 28, 1922. At this time he was granted a leave of absence. He returned to the Erie on November 16, 1922, serving again as mechanical superintendent on the Ohio region at Youngstown, O. On February 16, 1927, he was transferred in the same capacity to the Eastern district at Hornell, N. Y., which position he was holding at the time of his recent appointment as superintendent of motive power.

Charles James

Master Mechanics and Road Foremen

J. O. GREEN has been appointed master mechanic of the Mississippi Central with headquarters at Hattiesburg, Miss.

E. C. HOWERTON has been appointed road foreman of engines of the Denver & Salt Lake, with headquarters at Utah Junction, Colo.

ALBERT A. GAGNON has been appointed road foreman of engines of the Boston & Maine, with headquarters at Boston, succeeding G. C. Carver.

GEORGE T. DEPUE has been appointed master mechanic of the Erie, with headquarters at Weehawken, N. J., in charge of marine and dock equipment maintenance.

J. O. GREEN, mechanical engineer of the Gulf, Mobile & Northern at Mobile, Ala., has been appointed master mechanic of the Mississippi Central, with headquarters at Hattiesburg, Miss.

CHARLES J. GERBES has been appointed master mechanic of the Susquehanna Allegheny, Tioga and Bradford divisions of the eastern district of the Erie with headquarters at Hornell, N. Y., succeeding C. H. Norton.

GEORGE MOTH, master mechanic of the Brandon Division of the Canadian Pacific at Brandon, Man., has been transferred to the Portage division, with headquarters at Winnipeg, Man., replacing A. M. West, who has retired.

C. R. KILBURY, master mechanic of the Southern Kansas division of the Missouri Pacific, has been transferred to the Omaha and Northern Kansas divisions, with headquarters at Falls City, Neb., succeeding G. T. Callender.

Shop and Enginehouse

J. C. TREACY, formerly shop superintendent of the Great Northern at Devils Lake, N. D., is now shop superintendent at Superior, Wis.

W. D. LYONS, toolroom foreman of the Illinois Central, has been promoted to drop pit foreman, with headquarters at McComb, Miss.

F. B. NICHOLSON, machine foreman of the Missouri Pacific, has been promoted to toolroom foreman, with headquarters at Little Rock, Ark.

F. L. HENIG, production foreman of the Missouri Pacific, has been promoted to assistant machine foreman, with headquarters at Little Rock, Ark.

A. C. RINKER, formerly shop superintendent of the Great Northern at Superior, Wis., is now shop superintendent at Dale street, St. Paul, Minn.

F. W. BECKSTROM, assistant machine foreman of the Missouri Pacific, has been promoted to machine foreman, with headquarters at Little Rock, Ark.

GEORGE DABNER, general foreman of the Missouri Pacific at St. Louis, Missouri, has been transferred to Sedalia, Missouri, succeeding P. G. Treadway.

L. H. STENGEL, general foreman of the Illinois Central at Jackson, Miss., has been appointed district foreman, with headquarters at New Orleans, La.

L. L. SMITH, machinist of the Illinois Central, has been promoted to toolroom foreman, with headquarters at McComb, Miss., succeeding W. D. Lyons.

J. N. MEEK, general foreman of the Illinois Central at Gwen, Miss., has been appointed general foreman, with headquarters at Jackson, Miss., succeeding L. H. Stengel.

J. E. GOODWIN, night enginehouse foreman of the Missouri Pacific at Horace, Kan., has been promoted to assistant erecting foreman, with headquarters at Little Rock, Ark.

PAUL G. TREADWAY, general foreman locomotive department of the Missouri Pacific, Sedalia, Mo., has been transferred to the position of general foreman of the St. Louis, Mo., shops.

J. K. MCCANN, storekeeper on the Chicago, Burlington & Quincy, with headquarters at St. Joseph, Mo., has been appointed general piece work inspector, with headquarters at Chicago.

FRANK T. SPILLMAN has been appointed general foreman, locomotive department, of the Minneapolis, St. Paul & Sault Ste. Marie, with headquarters at Fond du Lac, Wis., succeeding Andred T. Taylor, retired.

JOHN H. MINETTE, assistant general foreman at the West Springfield shops of the Boston & Albany, has been appointed general foreman of the locomotive shops, with headquarters at West Springfield, Mass., succeeding Joseph W. Murphy, deceased.

Car Department

GEORGE E. COLLINS, assistant superintendent of car shops of the Chicago & North Western at Chicago, has been promoted to superintendent of car shops replacing E. P. Marsh.

E P. MARSH, superintendent of car shops of the Chicago & North Western, at Chicago, has been promoted to assistant superintendent of the car department, assigned to special duties and with headquarters at Chicago.

Purchases and Stores

S. OKRENT, storekeeper of the Chesapeake & Ohio at Handley, W. Va., has been transferred as storekeeper to Newport News, Va.

W. N. STRONG has been appointed storekeeper of the Chesapeake & Ohio, with headquarters at Cane Fork, W. Va., succeeding J. R. Grey, deceased.

G. K. PITCHFORD, storekeeper of the Chesapeake & Ohio, with headquarters at Newport News, Va., has been transferred in the same capacity to Handley, W. Va.

FRANK E. CRAGIN has been appointed general storekeeper of the Los Angeles & Salt Lake, with headquarters at Los Angeles, Cal., succeeding J. H. Cragin, deceased.

STEPHEN R. MANION has been appointed storekeeper of the Northern division of the Pennsylvania, succeeding Fred Rees, who has been transferred to other duties.

R. H. JOHNSON has been appointed storekeeper of the Chicago, Burlington & Quincy at Alliance, Neb., succeeding J. W. Schwartz, who has been transferred to St. Joseph to succeed J. K. McCann.

LEON S. MYERS has been appointed division storekeeper on the Northern Pacific, with headquarters at Tacoma, Wash., succeeding Milton A. Cole, who retired on December 1 after 40 years in the service of that company.

ARTHUR M. GAGE, who has been promoted to general storekeeper of the Michigan Central, with headquarters at Detroit, Mich., was born on September 10, 1883, at Berea, Ohio. He entered railway service on July 17, 1902, with the Lake Shore & Michigan Southern (now a part of the New York Central). From June 1, 1909, to September 1, 1909, he was a storekeeper on the Lake Erie, Alliance & Wheeling, now a part of the New York Central, and from September 1, 1909, to March 1, 1910, he was a storekeeper on the Lake Shore & Michigan Southern at Englewood, Ill. On the latter date he was promoted to assistant storekeeper, with headquarters at Elkhart, Ind., which position he held until July 1, 1912, when he was appointed storekeeper on the Lake Erie & Western, with headquarters at Lima, Ohio. On August 7, 1920, he was promoted to assistant general storekeeper of the Michigan Central, with headquarters at Detroit, Mich., which position he has held until his recent promotion.

Obituary

W. F. NAUMANN, division storekeeper of the Illinois Central, with headquarters at East St. Louis, Ill., died in that city on October 28.

JOSEPH H. DESALIS, former master mechanic on the New York Central at East Syracuse, N. Y., died there on October 27 of heart disease.

THOMAS O. WOOD, purchasing agent of the Gulf, Colorado & Santa Fe, with headquarters at Cleburne, Tex., died on December 10 at Temple, Tex., at the age of 77 years. Mr. Wood was taken suddenly ill at Oakdale, La., while on an inspection trip.

DAVID J. REDDING, who retired recently as superintendent of motive power of the Pittsburgh & Lake Erie, because of ill health, died on December 8 at his home in Dormont, Pa. A photograph and biographical sketch of the railroad career of Mr. Redding appeared in the October *Railway Mechanical Engineer*.

J. H. CRAGIN, general storekeeper of the Los Angeles & Salt Lake, who died at Los Angeles, Cal., on November 28, was born on June 9, 1859, at Salmon Falls, N. H. He entered the service of the Union Pacific in November, 1887, as a clerk in the office of the agent at Ord, Neb. For the next five years Mr. Cragin worked in various departments of the U. P. and in 1892 he first entered the stores department as a helper at Grand Island, Neb. In 1893 he was promoted to storekeeper, with headquarters at Evanston, Wyo., where he remained until 1903 when he was transferred to Salt Lake City, Utah. Mr. Cragin was promoted to general storekeeper of the Los Angeles & Salt Lake, with headquarters at Los Angeles, in 1907, a position he held continuously until he died.